FACTORS AFFECTING THE IMPLEMENTATION OF AN ELEMENTARY SCIENCE CURRICULUM IN THREE NORTHERN SASKATCHEWAN PROVINCIAL SCHOOLS

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Daryl George Arnott

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Dr. Alan Ryan
Department of Curriculum Studies
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0

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ABSTRACT

This qualitative study explores factors affecting the implementation of an elementary science curriculum in three schools in northern Saskatchewan. Data gathered from thirteen elementary level teachers indicate that most teachers interviewed possess a general vision of ideal science teaching and learning close to that presented in the provincial curriculum, but that most teachers believe that they are a considerable distance away from translating that vision into reality. Data indicate that few teachers use the curriculum on a regular basis or possess detailed familiarity with its components.

A variety of generic factors not unique to the north are creating challenges for teachers striving to implement the science curriculum. Tight timelines for implementation, as well as challenges such as class size, limited inservice availability, and infrequent networking opprtunities were identified as challenges. Many challenges were linked to the need to refine or acquire skills made more necessary by new curricula, as well as by other provincial and regional initiatives. The need to address such skill deficits is felt by most teachers, but is felt most acutely by those who are not recent graduates of teacher-training programs or those who rely primarily on locally available professional development within the context of the regular school year and setting.

Teachers in this study indicated that a greater degree of instructional leadership at the school division and school level would assist them in their efforts to implement mandated changes. Concern was also expressed that little monitoring of the implementation process by either their school division or by the provincial government had taken place.

A variety of factors unique to the North were identified as affecting implementation efforts. Teachers found the curriculum to be easily adapted for northern needs, as well as appropriate for students for whom English is a second language. General funding levels and special school division initiatives were also seen as helpful. Respondents, however, identified socioeconomic factors, questionable levels of instructional leadership, as well as distance between community and school as serious challenges to implementation.

This study confirms current research indicating that managing changes such as the implementation of an elementary science curriculum is a complex venture necessitating organizational and operational changes at school, school division, and provincial levels to encourage and support efforts to make schools learning organizations for both students and teachers. The study concludes with several recommended areas of further research, as well as with several specific action recommendations to assist with the implementation of new curricula.

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DEDICATION

This thesis is dedicated to my wife Carol and my three sons Ryan, Brett and Nathan for their support and encouragement throughout this venture. Their patience and understanding in dealing with those everpresent boxes of data and binders, their self-reliance during my absences at summer school, and their tolerance of my constant pre-occupation, made this thesis possible. What you read is the culmination of a family effort spread over five years.

A world where change is a journey of unknown destination, where problems are our friends, where seeking assistance is a sign of strength, where simultaneous top-down bottom-up initiatives merge, where collegiality and individualism coexist in productive tension. It is a world where change mirrors life itself in which you can never be perfectly happy or permanently in harmony, but where some people--those with knowledge of how to view, cope with and initiate change--manage much better than others. (M. Fullan, 1993, viii)

CHAPTER 1: SETTING THE STAGE

Background

Northern Saskatchewan is very different from the rest of the province in many respects. The majority of students in northern schools are of aboriginal ancestry. In 1986 Census Canada figures stated that 63.2% of northern Saskatchewan residents were native as compared to the total provincial figure of 5.5% for that same year. Northern Saskatchewan also has a different economic focus than the rest of the province. The natural resources of northern Saskatchewan supply much of the region's wealth.

The area described in this study as "The North" covers more than 125,000 square miles and includes most of the northern half of Saskatchewan. The area is dominated by forests, rivers, lakes, muskegs, and the Pre-Cambrian Shield. Rugged and beautiful are terms commonly used to describe the geography of much of the region. For centuries the fur trade provided the livelihood of many of the people in the region. Commercial fishing was an important economic activity, particularly during the early part of this century. Fishing continues to be a way of life for many northerners. Tourism and mining have risen in importance over the last thirty years. The development of hydro-electric power has an impact on the lives of many residents. The vastness of the North, with its sparse population, has limited the development of integrated economic activity. Physical and climatic factors have limited population growth.

The Northern Education Task Force identified numerous challenges facing northerners and having a major impact on education in the region. The dropout rate among native students remains unacceptably high, and cultural differences remain difficult to address (1989a). In northern Saskatchewan, six to seven percent of students entering school graduate (Saskatchewan Education, 1994).

Northern people, in many cases, remain alienated from the school system. The lack of meaningful job opportunities in the North often makes education a seemingly futile pursuit. Linkages between education, training, and the labour market are often not visible to northerners. Social problems such as alcohol and drug abuse, family disruption, and hunger have a negative effect on the school system (Saskatchewan Education, 1989a, p. 23).

Northern Saskatchewan is made up of a variety of regions containing a great number of communities, each with their own identity and issues. Communities are eager to see a coherent and effective approach to Indian Languages instruction, transitional programming, cultural awareness, and instructional and evaluation approaches. A move toward more community involvement and decentralization is very noticeable.

Northern Saskatchewan has within it two education systems: a provincial school system as well as a band system. Indian bands operate their schools independently of the provincial educational system, receiving their funding from the federal government. Band schools operate under the general authority of the chief and council, but in most instances a local School Committee plays a major role in matters such as selecting staff and contributing to the development of general school policies and practices. Teachers in band schools are not granted accreditation, therefore all grade twelve students in band schools must write departmental examinations. In addition, high school programming is approved by the provincial Department of Education, Training and Employment. In some communities a move is under way to move schools from provincial to band control. In many communities, both band and provincial, efforts are being made to extend schooling into high school to lessen the incidence of students having to move from their home communities in order to attend high school. Students often move from community to community, in many cases moving between provincial and band school settings. In some instances teachers move from one

system to the other. Linkages between Saskatchewan Education and the Prince Albert Grand Council (in the far north and in the east) and the Meadow Lake Tribal Council (in the northwest) are cooperative and growing more frequent as many Indian Bands move toward policies requiring teachers to utilize provincial curricula.

The provincial school system in the north is unique in terms of administrative structure. The region contains within it three school divisions. Ile-a-la-Crosse School Division consists of one large school serving the needs of students from kindergarten through grade twelve. Creighton School Division consists of a large kindergarten through grade nine school, with high school students attending a collegiate in neighboring Flin Flon, Manitoba. These two school divisions are six hundred kilometres apart and, though independent of each other, share a Director of Education, based in the regional office of Saskatchewan Education, Training and Employment in La Ronge. Northern Lights School Division, the third provincial school division in the region, provides services to twenty-eight schools varying from isolated one-room schools to large high schools in relatively urban settings. This school jurisdiction spans the northern half of the province and has its administrative hub in La Ronge. Northern Lights School Division is administered by a Director of Education, assisted by a Deputy Director, two Superintendents of Education, and a cadre of consultants and support staff.

Supervision of specific schools is divided between the Director, Deputy Director, and Superintendents of Education. Assignment of schools is done largely on a geographic basis, with additional focus areas, such as Special Education, assigned to one of the four. A school division sub-office in Beauval serves the needs of west side schools and houses one of the Superintendents of Education, as well as support staff for west side schools.

The Northern Lights School Division Board is made up of a variety of individuals representing the various regions within the division. These members meet each month in La Ronge and play a very active role in determining the focus of school division efforts. For most school division board members, the position of Board Trustee is a full time job.

All educational matters pertaining to provincial schools in northern Saskatchewan are overseen by a northern regional office of education, based in La Ronge. There are seven such regional offices in Saskatchewan, strategically located to provide services to various portions of the province. For many years the provincial presence in education was referred to as the Department of Education. For most practicing teachers the term most commonly used is Saskatchewan Education. Within the last year the label for the provincial ministry has been changed to the Department of Education, Training, and Employment. The northern office of the Department of Education, Training, and Employment is unique from other regional offices in several respects. The most notable difference is that this office serves the needs of students within one half of Saskatchewan. This geographic reality creates a vast array of challenges not the least of which is distance.

The La Ronge office of Saskatchewan Education contains within it both K-12 and post-secondary educational personnel. The Regional Director in charge of K-12 issues works with two coordinators--one overseeing Special Education initiatives in the region, and the other a Regional Coordinator of Curriculum and Instruction. It is this curriculum coordinator who coordinates provincial and regional curriculum and instruction initiatives within the northern region, including Core Curriculum.

At the time of writing I am completing my fifth year as Regional Coordinator of Curriculum and Instruction in the northern region. I am well

known to educators in the region's schools and central offices, as well as to personnel in other regional offices and in Regina. A solid working relationship exists with all three sites focused on in this study, and although viewed as representing "the Department" I am also perceived as an educator with roots in the classroom. Over the years I have made a point of making evident my classroom links--links developed over ten years of duties as classroom teacher and teacher-librarian in rural Saskatchewan. My linkages with Core Curriculum began in the early 1980's when the curriculum renewal process began in this province, continued through my experiences with piloting Social Studies 8, one of the first of the new programs, and continues now as a seconded employee of the provincial government.

Curriculum Change in Saskatchewan

"Change is at once simple and complex" (Fullan, 1985, p. 391). To orchestrate change effectively requires a clear understanding of the array of variables at work, as well as an ongoing assessment of what is and what is not working. Earle Newton, in a presentation to Saskatchewan school administrators, characterized initiatives for educational change in Saskatchewan as exhibiting numerous and top down pressures, and a local scene characterized by economic hardship, increasing diversity among partners, soaring expectations and powerful political forces (Newton, 1992). These situations combine to offer challenges to those implementing change.

Core Curriculum, a provincial curriculum renewal initiative, consists of four key elements: Required Areas of Study, the Common Essential Learnings, the Adaptive Dimension, and Locally Determined Options. The Required Areas of Study are what were traditionally know as the subject areas of school education. The focus of this study, Science Education, falls within this component of Core

Curriculum. Curriculum renewal efforts associated with Core Curriculum are focused on all areas of study at all grade levels. Curriculum evaluation, development, and implementation have been and are taking place in Science.

During the 1993-1994 school year the focus of implementation was on Language Arts at the elementary level. During the 1992-1993 and 1991-1992 school years the focus of implementation was on the new Elementary Arts Education curriculum. The new Science program at the elementary level was introduced into northern provincial schools during the 1990-1991 school year. This activity-based, student-centered, resource-based program was introduced with two days of inservice.

The model for implementation inservice used in Saskatchewan could be called a teacher teaching teacher model. New curricula such as Science are piloted throughout the province. These pilot teachers work with evolving documents and provide suggestions for revision. Inservice facilitators are selected from the ranks of these pilot teachers. This cadre of educators receives training to help them deliver inservice to teachers in their region who will be implementing the curriculum.

To support the implementation of the new elementary Science program additional funding was provided by the school division, based on an enrolment formula, and provisions were made to set up a Science Steering Committee: a committee still in operation at the time of writing. Since the initial implementation year the school division involved in this study has had at its disposal the services of a science consultant whose job it is to assist with ongoing implementation and to visit classrooms on a regular basis. Initially, the consultant's main area of attention was the provision of resources to support the science program. More recently, the focus has been on providing networking opportunities to help deal with implementation challenges such as planning and

instruction.

The Science Curriculum for the Elementary Level (Saskatchewan Education, 1990) contains a curriculum guide outlining the program of study and providing support for planning, instruction, assessment and evaluation, as well as a second document identifying resources which support the various core and optional units. An accompanying bibliography provides additional suppport in the area of resources.

Rationale for the Study

Substantial research has been undertaken in the area of implementing change but very little study has focused on the implementation of Core Curriculum in Saskatchewan. Teachers in northern Saskatchewan have been working at implementing the elementary science curriculum for four years. To date no study of the implementation of any component of Core Curriculum has been undertaken in northern Saskatchewan.

"The road to improvement is always under construction" (Fullan, 1992b) and we need to ascertain whether construction is proceeding effectively and in the direction envisioned. In 1975, Fullan and Pomfret stated that "researchers are asked to concentrate more on facilitating implementation than measuring outcomes, especially in a programme's early stages. The implementation process is suggested as a more important research focus than degree of implementation" (p. i). Learning outcomes are valuable, but "in themselves, they tell us very little about the process of change" (p. 18).

Research Focus

This qualitative study does not focus directly on student learnings but rather focuses on the implementation process as seen through the eyes of teachers. The purpose of this study is to identify factors affecting the implementation of the elementary science curriculum in three northern schools. For the purposes of this study implementation is defined as "the degree to which the vision of the innovation, as outlined in the curriculum guide, is translated into reality."

My basic research question was:

> "What factors do teachers feel have affected the implementation of elementary level science in three provincial schools in northern Saskatchewan?"

This question was explored using the following sequence of inquiry:

> "What is the teacher's vision of a classroom where elementary level science education is taking place?"
>
> "Where is the teacher in the achievement of the vision?"
>
> "What factors have helped or hindered teachers in translating the vision into reality?"

Delimitations

This study could easily have expanded into a massive study of almost all components of curriculum change. Other researchers have already dealt with these areas. I chose to focus on key factors affecting implementation, putting less emphasis on generic factors, while spending greater time and effort on what could be considered factors specific to the region under study.

Northern Saskatchewan is a vast land of forests, lakes, rivers, muskegs, and rugged Pre-Cambrian rock. Settlements are widely scattered. Road conditions vary greatly but are often rough, twisting, hilly and are always long. Some communities are linked to other settlements only by air. Due to these geographic realities, and resultant cost and time factors, I chose to visit only three sites. I also chose to limit myself to uncovering the perceptions of educators in schools rather than expand my focus to include administrative and supervisory personnel at the school division level.

Ethical Considerations

When conducting qualitative research it is important that the researcher realize that participants are very vulnerable. Trust is extremely important. I ensured that the subjects were aware of the purpose of the research and the manner in which it would be conducted. Participation in the research was voluntary, and withdrawal was possible at any time. Measures were taken to ensure confidentiality. Names of schools and teachers were changed. Specific details or references which could easily lead a reader to deduce the identity of the participant were made more generic. This was a particular concern in sections dealing with potentially sensitive issues.

Given my identification with the issue under study, I needed to put a great deal of effort into creating a disarming atmosphere in which open dialogue could take place. I believe that the fact that I have worked with most of these individuals and have built a reputation for being open-minded, change-oriented, and tactful, assisted me in these efforts. At the beginning of the interview it was made clear that the primary focus of the research was factors affecting implementation and not on personal performance in teaching.

Every effort was made to explain to the respondent the purpose of the research. The Director of Education was consulted prior to the commencement of research. My letter of request is included as Appendix A, with the Director of Education's response included as Appendix B. I developed a Confirmation of Participant/Researcher Roles document which outlines ethical principles which were observed during the course of the study. This was presented and explained to potential participants prior to the interview and is included as Appendix C. A Participant Release Form, included as Appendix D, was signed by all participants, indicating their agreement with the contents of the interview transcripts, as well as indicating any portions of the interview they wished to have deleted or altered.

The Sites

My research focused on three sites--Dennis Gorman School, Thunder Ravine School and Electric Falls School. The names of these three schools have been altered to help ensure anonymity. All three schools studied contain a majority of students who are of aboriginal ancestry and have English as a second language (ESL). In one community Dene is the predominant language, while in the other two communities Cree is most commonly spoken. In all three schools we find teachers with varying levels of experience teaching students who have

English as their second language.

Dennis Gorman School is situated in a larger northern community with road and air linkage with the rest of the province. Thunder Ravine is a smaller community in the far northern part of the region, linked with the rest of Saskatchewan only by air. Electric Falls, in terms of size, falls in between and is linked by road with outside areas. However, given the driving distance from other communities and the condition of the road, Electric Falls is relatively isolated. Thunder Ravine School is a kindergarten to grade nine school, Dennis Gorman School is a kindergarten to grade six school, while Electric Falls is a larger kindergarten to grade twelve site.

All three schools have teachers on staff whose years of experience in northern schools varies. Thunder Ravine School differs from the other two sites in that it contains more teachers with fewer years of teaching experience, more teachers teaching in grades or subject areas they lack experience or training in, as well as teachers with fewer networking opportunities available, a common situation in far northern schools. All schools receive central office support, but Thunder Ravine and Electric Falls are visited infrequently by consultants and supervisory personnel. All three sites have access to inservice, though delivery formats vary somewhat.

All three schools contain students for whom a traditional lifestyle is very much alive, as well as students who have a very limited awareness of their culture. All schools require varied approaches to programming, instruction, and learning environment and use multi-grade classrooms. All three schools are attempting to place a greater emphasis on culture, language and special needs, and are within the same school division. Thunder Ravine has a wider range of grades contained within each class. School administrators vary in experience.

My selection of the three sites was an attempt to represent a variety of realities present in northern Saskatchewan. The three sites chosen for this study represent many characteristics of northern schools but they do not contain all such characteristics. Other schools in the north contain unique characteristics aside from those exhibited by the sample, and conclusions drawn from this research cannot be generalized to such situations.

It is hoped that this study of implementation will assist educators in making decisions to assist with successful implementation of Core Curriculum components in northern Saskatchewan. "One of the most needed areas of research in the area of curriculum innovation is to start with the teacher instead of the innovation" (Fullan & Pomfret, 1975, p. 121). The teacher is the focus of this study. This study is an attempt to paint a composite picture of three northern schools immersed in Core Curriculum implementation, of which the new elementary science curriculum is one component. It is hoped that this picture will help northern educators make decisions to enhance the implementation of this, and perhaps other, programs.

CHAPTER 2: LITERATURE REVIEW

Overview

In this chapter I provide a general overview of the history of the study of educational change in North America, examine some of the general characteristics of educational change, then move into a more detailed examination of factors which are generally considered to have an effect on implementation efforts. I have organized these factors into three general categories: characteristics of the change, local factors, and external factors. At the conclusion of the chapter I outline several reasons why reforms are often not successfully implemented.

Historical Perspectives on Change

A considerable amount has been written about educational change. Synthesizing this writing is a challenging task since, if there is one thing upon which the literature agrees, it is that educational change is multidimensional and complex. Waugh and Punch (1987) and Newton (1990) outline a general history of the study of planned change. The examination of planned change began in the 1940's as attempts were made to understand the process of diffusion of technical innovations. Between 1954 and 1974 there was a noticeable acceleration in the literature, concentrating primarily on the adoption of innovations by individuals. This emphasis on individuals drew attention away from studies of organizations, an area now viewed as critical to a well-rounded study of the implementation of innovations.

Educational change in the 1960's was initiated naively, with great sums of money applied to national curriculum effort on a grand scale. "It was assumed, but not planned for, that something was bound to come of it" (Fullan, 1993, p.1).

People investing time and energy in change programs often had a content orientation. "They often took for granted strategies for educational change, and they were limited to rather simplistic models on how to develop and implement their programs within the educational system" (Dalin, 1978, p. 8).

After about 1974 attention shifted to the change process itself. The first studies of implementation surfaced around 1970, and indicated that the approach taken in the 1960's had not been very effective. There followed a period of recovery and regrouping during the 1970's when some questioned the capacity of the educational system to reform. By the end of the 1970's the effective schools movement and the work of individuals in the area of inservice and staff development had restored some optimism. By 1980 it was generally agreed that "we knew a fair amount about the major factors associated with introducing single innovations" (Fullan, 1993, p.2).

During the last ten years attention has been on the context for specific educational changes. "The difficulties in effectively implementing change in education have shifted the efforts of researchers from a theory of change to a theory of changing, with emphasis on gaining understanding of the dynamics of the process over time" (Newton, 1990, p. 141). The study of change since 1970 has moved from "documentation of failure to analysis of success, and now emphasizes the management of change" (Fullan & Newton, 1988, p. 406).

By 1983 individuals and organizations in the United States were calling for large-scale governmental action to deal with an educational system which was seen by some to be putting the nation at risk. In the early 1990's, still striving to improve the educational system, we are no longer considering only individual innovations, but are focusing on more comprehensive reforms and attempting to understand and deal with complex change. Some see hopes for meaningful educational change as lying in changes to basic educational institutions and

beliefs.

Fullan (1993) provides an outline of current views of educational change held by some:

> The answer does not lie in designing better reform strategies. No amount of sophistication in strategizing for particular innovations or policies will ever work. It is simply unrealistic to expect that introducing reforms one by one, even major ones, in a situation which is basically not organized to engage in change will do anything but give reform a bad name. You cannot have an educational environment in which change is continuously expected, alongside a conservative system and expect anything but constant aggravation. The new problem of change is what would it take to make the educational system a learning organization--expert at dealing with change as a normal part of its work, not just in relation to the latest policy, but as a way of life." (Fullan, 1993, p. 4)

In addition to examining the change process, we are now moving toward an examination of whether existing educational structures and norms can allow needed reforms to take place. Linked with this is an examination of how school systems and organizational norms can be restructured to facilitate change.

Components of Change

Fullan and Pomfret (1977) suggested that there were at least five dimensions of implementation in practice--changes in materials, structure, role/behavior, knowledge and understanding, and value internalization. In 1991 Fullan synthesized earlier views and stated that materials, teaching approaches, and beliefs were three important components of educational change. An individual may implement none, one, two, or all three. Change in materials and resources are often the most visible aspects of change and are often the easiest to

implement. Changes in teaching approach often pose greater difficulty. Attempting to change beliefs can be the most difficult aspect of change, since beliefs are often assumed rather than explicit (Fullan, 1982, p. 35). Many staff development initiatives presuppose that change in teacher beliefs, attitudes and perceptions should precede changes in teacher behaviours and practices. Current research indicates that this assumption may be inaccurate, most notably with experienced teachers.

Significant change in teacher beliefs and attitudes is likely to take place only after they see evidence of changes in student learning as they work with the innovation (Guskey, 1986). The management of change also calls for balancing and combining factors which upon first glance do not seem to go together. Simplicity-complexity, looseness-tightness, strong leadership-participation, top down-bottom up, fidelity-adaptation, and evaluation-nonevaluation are such seemingly incongruous pairings (Fullan, 1985).

Change is Personal

Each individual approaches the change from his or her own perspective (Fullan, 1982, p. 30). At the heart of the issue is how individuals come to grips with the change on a personal level. Marris (1975) states that all real change involves loss, anxiety and struggle. New experiences are always initially reacted to in terms of some "familiar, reliable construction of reality" (p. 166). The process of integrating the change with one's personal reality can be an involved process taking time and touching on a wide range of personal issues ranging from materials and their usage through to personal beliefs. To think that mandating change will automatically lead to implementation ignores what we know about educational change. Marris (1975) puts this aptly in the following passage.

> No one can resolve the crisis of reintegration on behalf of another. Every attempt to pre-empt conflict, argument, protest by rational planning, can only be abortive: however reasonable the proposed changes, the process of implementing them must still allow the impulse of rejection to play itself out. When those who have power to manipulate changes act as if they have only to explain, and when their explanations are not at once accepted, shrug off opposition as ignorance or prejudice, they express a profound contempt for the meaning of lives other than their own. For the reformers have already assimilated these changes to their purposes, and worked out a reformulation which makes sense to them, perhaps through months or years of analysis and debate. If they deny others the chance to do the same, they treat them as puppets dangling by the threads of their own conceptions. (p. 166)

If policy makers or staff developers have thought about a problem and reached some conclusions, they may not realize the process they have gone through to get to that point. "Once people come to a conclusion about something being the right thing to do, they often then approach others without sufficient empathy about what those individuals also have to go through to reach a conclusion" (Sparks, 1992, p. 7). Miles and Louis (1990) indicate that good problem-coping by those initiating and implementing the change is the single biggest determinant of program success. They characterize good problem-coping as including dealing with problems promptly, actively, and with some depth.

The personal costs of trying new innovations can be high and doubts often arise as to whether the innovations are worth the investment of time and effort. All real change involves a degree of loss, anxiety and struggle. Dangers lie in store for those who do not take into account the personal nature of educational change. "The extent to which proposals for change are defined according to only one person's or one group's reality is the extent to which they will encounter problems in implementation." (Fullan, 1982, p. 29).

Change Is a Process

Change is described as "a process, not an event" (Fullan, 1991a, p. 49). Schon (1971) compares change to being lost at sea, as you confront more information than you can handle while passing through "zones of uncertainty" (p. 71). Fullan (1992b), in a presentation to a group of Saskatchewan educational administrators, compared educational change to a voyage into uncharted waters in a leaky boat with a mutinous crew. Other authors have used other metaphors to describe the complex process of change. I quote House (1974), who provides a particularly vivid metaphor:

> Educational change might be conceived like wave motion. Innovations generated or broadcast are diffused through social networks. During transmission the innovation is transformed and, if received, is again transformed in accord with the structure of the receiver. There are many sources of messages, as there are many broadcasting stations. The messages are sometimes similar, sometimes disparate. As they traverse the social networks, however, the waves intermingle, sometimes in phase, reinforcing one another, and sometimes out of phase, conflicting with one another. The receiver picks up garbled messages, usually because several messages have been transmitted simultaneously, which must somehow be deciphered. If one compares the original innovation with its implementation, it looks impure, more like a mongrelization of noise, because of the perversity of the receiver. But it is only because the sender sees just the plain light of his own message. (p.14)

Early investigations of the process of educational change suggested that teachers go through development stages focused on self, task, and impact (Hall & Loucks, 1977). When a change effort is in its early stages, teachers are very likely to have self concerns. Task concerns usually become more intense as preparations are made to begin using the innovation and during early use. When teachers' most intense concerns are about the effects of an innovation on students

and what can be done to improve the effectiveless of the program they have reached the impact level. "To move through this process takes time--three to five years for change to reach the stage of teacher concern for the needs of students" (Hord, Rutherford, Huling-Austin, Hall, 1987, p. 31).

Hall & Loucks (1977) outlined seven levels of use: non-use, orientation, preparation, routine-mechanical use, refinement, integrated use, and renewing. This process was identified as the Concerns Based Adoption Model. Each of these levels indicates growth in quality of use of an innovation. Because of the presence of these various levels, strategies need to be developed in order to facilitate growth. Through the use of a Stages of Concern Questionnaire (Hord, Rutherford, Huling-Austin, Hall, 1987, p.34) a profile of the individual can be developed--a profile that can lead to more effective support strategies. Hall, Loucks, Rutherford & Newlove, (1975) envisioned the selection of "appropriate intervention strategies and tactics to facilitate growth in the use of the innovation while minimizing the trauma of change" (p. 56).

The first several months of trying something new are usually problematic. This "implementation dip" (Fullan, 1991b, p. 03) is a natural experience in dealing with new skills and understandings and many initiatives are abandoned at this stage. When we try something which is significantly new, things will get worse before they get better.

Most researchers see three general phases to the change process. The initial phase, labelled by Fullan as "adoption" is the process which "leads up to and includes a decision to adopt or proceed with a change" (Fullan, 1991a, p. 47). The second phase, usually called "implementation", encompasses the first experiences of "attempting to put an idea or reform into practice" (p. 47). The final phase, which Fullan calls "institutionalization" refers to "whether the change gets built in as an ongoing part of the system or disappears by way of a decision to discard,

or through attrition" (p. 48).

The various phases of the change process can take varying lengths of time and are not linear, but rather are a process "in which events at one phase can feed back to alter decisions made at a previous stage which then work their way through in a continuous interactive way" (Fullan, 1991a, p. 48). Boundaries between phases commonly blend into each other. The focus of this study is Fullan's middle phase, which he calls "implementation." A variety of factors combine to influence implementation. Certain factors are mentioned frequently in the literature and can be organized into three broad categories: characteristics of the innovation, characteristics of the implementing unit or situation, and macro or socio-political factors.

Fullan (1991a) indicates that the more factors supporting implementation, the more change in practice will be accomplished. Factors can be broken down into sub-factors and as the field of view changes, one may see different things and the relative degree of impact of various sub-factors may shift.

Factors affecting implementation do not operate in isolation. Rather, they interact in a constantly varying manner as the process of change takes place (Fullan, 1982). "Change is a journey, not a blueprint" (Fullan, 1993, p. 24). You do not really know what is going to be significant until you are into the implementation process. Stacey is quoted in Fullan (1993) as stating that "route and destination must be discovered through the journey itself if you wish to travel to new lands" (p. 25). Add to this the fact that we are dealing with a mix of people interacting in a given place and time, at various stages of professional growth, dealing with changes which feed and influence further change, and we have a solid rationale for an open-minded, contextually sensitive approach to studying innovation.

I draw extensively from Fullan and Pomfret (1975) to emphasize the need to focus on the implementation phase. This early study provides one of the most extensive explanations as to why we need to focus on implementation and claims that we often pay more attention to adoption than we do to implementation.

> It is more rewarding to promote greater reported use of an innovation than to become involved in the complex and time consuming problems of implementation. For school boards, superintendents, and principals it is similarly more rewarding to have the semblance of progressiveness, and to avoid the political and resource demands of uncovering and working with the conflicts of implementation. For the teachers it is safer psychologically and politically to appear to be innovating than to reveal the anxieties, doubts and difficulties of using a new curriculum. Added to this are the structural gaps which make it unlikely that planners and users will have the contact and normative relationships necessary for identifying, let alone confronting implementation problems. (p. 17)

A great variety of factors can affect the implementation of an educational initiative. In order to better examine and understand the complex implementation process as it applies to elementary science education in northern Saskatchewan I group factors into three general categories: characteristics of the change, local factors, and external factors. Each are examined in the following sections.

Factors Affecting Implementation

Characteristics of the Change

Need

Much of the literature refers to motives for educational change. Many innovations are attempted without reflection on whether or not they deal with

what are seen as priority needs (Fullan, 1991a). Teachers do not always share a sense of urgency with the initiators of the reform. This is particularly the case if reforms are initiated because of reasons such as short term funding availability or a need for a stop-gap measure to mollify a vocal interest group.

Schools often have agendas full of high priority initiatives and schools in northern Saskatchewan are no exception. It is often "not only whether a given need is important, but also how important it is relative to other needs" (Fullan, 1991a, p. 69). In addition, exact needs are sometimes not clearly evident until implementation is underway, and needs can vary from community to community. To one community preservation of culture may be of greatest importance while in another community preparation for the workplace may be a more pertinent goal. Also, the need for the innovation interacts with the other factors to either clarify or confuse the implementation process (Fullan, 1991a). It is important that school needs or district needs match the new program but the fit may not become entirely clear until implementation is underway.

Clarity

Clarity about goals and means pertaining to educational change is a perennial problem (Fullan, 1991a, p. 70). Problems related to clarity can include such things as vague goals or unclear implementation strategies. Commonly policies, and even procedures, are stated at a general level in order to minimize controversy and therefore help ensure adoption. This same vagueness may become an obstacle as implementation proceeds. Miles and Louis (1990) point to the need for "action images". People must have an image of "what to do to get there" (p. 58). Vague goals and strategies may make this difficult.

Clarity can be elusive. It is very easy to look at a proposed change and identify what is thought to be its essence. However, this may only be because a lack of detailed understanding of the innovation has led to false clarity (Fullan, 1991a, p. 70). It is only after working with the innovation over a period of time that we come to experience and understand its complexities.

Clarity contains within it several components. In several studies of high school innovations Newton (1989) identifies lack of clarity pertaining to vision and goals as an area requiring attention. Those implementing an innovation can be perfectly clear about the details of various components, but can lack a clear understanding of the vision and goals of the program. Clarity refers to details, but also to the general sense of direction and purpose of the innovation. Teachers may know how to facilitate specific activities in a suggested resource but may not possess an understanding of resource based learning beyond one key resource.

Reference is made to the "dilemma of explicitness" (Fullan, 1982, p. 62). To make an innovation explicit at the development stage may restrict flexibility. However, an innovation which is not explicit runs the risk of confusing practitioners. Whether or not a program's explicit nature hinders or assists implementation can also depend on the time frame. A complex change implemented over an extended period of time need not be explicit initially. A certain lack of explicitness can allow adjustments to take place.

When implementing a complex innovation the phrase "ready, fire, aim" (Fullan, 1993, p. 31) can be appropriate. A certain amount of readiness is needed but "it is important to get to work on the doing and not to go overboard in planning" (Sparks, 1992, p. 3). "Ready is important, there has to be some notion of direction, but it is killing to bog down the process with vision, mission, and strategic planning, before you know enough about dynamic reality. Fire is action and inquiry where skills, clarity and learning are fostered. Aim is crystallizing

new beliefs, formulating mission and vision statements and focussing strategic planning" (Fullan, 1993, p. 31).

Implementation can be described as "a dynamic construct, which refers to the process of continuous specification and redefinition of the essential characteristics of an innovation by developers and users during the planning and implementation phases of the planned change process" (Fullan and Pomfret, 1975, p. 71).

Complexity

Any change can be looked at in terms of the "possible use of new or revised materials, the possible use of new teaching approaches and the possible alteration of beliefs" (Fullan, 1991a, p. 37). Complexity can create problems if schools "attempt to implement innovations that are beyond their ability to carry out" (Fullan, 1991a, p. 71). This overreaching is common in educational enterprises but complexity can result in greater changes because more is being attempted. Though there are more difficulties associated with more ambitious efforts, "these projects also accomplished more in terms of teacher change and were more likely to be continued" (Berman & McLaughlin, 1980, p.5). A change of major magnitude and complexity is difficult to sidestep or minimize, particularly if it touches on all aspects of the education enterprise. Ambitious and demanding innovations also "appeal to the teachers' professionalism" (p.5).

The answer to managing complex change can be to "break complex changes into components and implement them in a divisible and/or incremental manner" (Fullan, 1991a, p. 72). Complexity can be a barrier if the various components are dissonant and incoherent. If a complex change is composed of a variety of components which combine into a logical and coherent whole, complexity may

be an enabling rather that a hindering factor affecting implementation. Implementation of the elementary science curriculum can be described as a complex change since the curriculum contains a number of expectations regarding materials and their usage, instructional approaches, and beliefs.

Quality and Practicality of the Innovation

Teachers want materials and programs which have been developed with real classroom situations in mind. "Teachers carry with them to staff development programs a very pragmatic orientation. What they hope to gain through staff development programs are specific, concrete and practical ideas that directly relate to the day to day operation of their classrooms" (Guskey, 1986, p. 6). Whether or not the science curriculum and accompanying inservice are perceived as specific, concrete and practical may strongly affect the program's implementation. One must also caution against making hasty judgements. "With particular changes, especially complex ones, one must struggle through ambivalence before one is sure that the new vision is workable and right" (Fullan, 1991a, p. 73).

Local Factors

Local factors deal with the "social conditions of change" (Fullan, 1991a, p. 73) and refer to local factors along a continuum ranging from the larger school division, through board and community characteristics, eventually to the principal and the classroom teacher. Accordingly, planned change is both a matter of "motivating from without and orchestrating from within" (p. 73).

The School Division

Introducing innovations is a way of life in most school systems, and districts "build up track records in managing change" (Fullan, 1991a, p. 73). Northern Saskatchewan has had its share of initiatives aimed at addressing various education challenges. New programs of study have been introduced, with varying degrees of success. Veteran teachers commonly refer to provincial programs which were unusable in northern schools without substantial adaptation, or to resources unsuitable for many northern classrooms.

The support of central administrators is critical for change in school division practices to take place (Fullan, 1982, p. 65). Many teachers have a tough time taking change seriously unless administrative support is strong and visible. Administrators who remain invisible, but provide material resources to support change can positively affect implementation. However, it is in those schools where administrators get actively involved in change, and support the innovation in a visible and practical way, that real change takes place. "Teachers and others know enough now, if they didn't twenty years ago, not to take change seriously unless central administrators demonstrate through actions that they should" (Fullan, 1991a, p. 74). Significant differences in degree of implementation have been found in situations where assistance and support is received from supervisory personnel, including consultants (Fullan & Pomfret, 1975).

Many changes have implications in terms of the types of personnel required. Newton (1989) states that "we seem to continually underestimate the need to integrate personnel policies with our hopes for effective change." "Aspirations for student growth imply aspirations for growth on the part of other educational agents" (Leithwood & Montgomery, 1982, p. 160).

Board and Community Characteristics

Community support of the school correlates positively with innovativeness (Fullan, 1991a), but in contemplating or introducing innovations "districts frequently ignore the community and/or the school board" (p. 75). Most school communities are usually not directly involved in implementation but can become vocal about certain innovations (Fullan, 1982). Each northern community has an identity and underlying norms or protocols. Innovation can complement or challenge protocol, thus leading to more active community involvement. Whether a program complements, challenges, or has no effect on community norms or protocol can affect implementation.

Staff Development and Participation

At the root of all educational change is the learning of new ways of thinking and doing. As a result, staff development is a critical factor when the focus is on change. However, "the use of staff development can be grossly misapplied unless it is understood in relation to the meaning of change and the change process as a whole" (Fullan, 1991a, p. 84). Davies is quoted in Guskey (1986) as concluding that "inservice education is the slum of American education--disadvantaged, poverty stricken, neglected, psychologically isolated, riddled with exploitation, broken promises, and conflict". One of the great problems in educational reform is "not resistance to change, but the presence of too many innovations mandated or adopted uncritically and superficially on an ad-hoc fragmented basis" (Fullan, 1993, p. 23). "When it comes to implementation, more is sometimes less" (Fullan, 1991a, p. 84) if more materials and more inservice are disjointed.

"Training without subsequent follow-up leads participants down dead-end

paths" (Killion & Kaylor, 1991, p. 64). Staff development initiatives are a crucial component of curricular change. Initial inservice is important and usually provided. However, follow-up staff development initiatives are less regularly available. There are at least three major obstacles to follow-up for staff development--expense, disruption and time.

Examples of successful implementation tell us that, in addition to the necessity of support for teachers during initial implementation, there is a need for "continuous interaction with peers and consultants during the process of implementation" (Fullan & Pomfret, 1975, p. 44). One of the reasons many changes fail is because there is insufficient interaction during implementation. "People experience the process individually without the social/psychological support that's necessary for success" (Sparks, 1992, p. 7). Most forms of inservice training are not designed to provide the ongoing, interactive, cumulative learning necessary to develop new skills and beliefs. Interaction is important while learning something new. Research on implementation has demonstrated that sustained interaction and staff development are crucial (Fullan, 1991a).

There needs to be training "during, not just prior to, implementation"(Fullan & Pomfret, 1975, p. 24). Continuous training "is extremely important for effective implementation after adoption" (p. 31). There is a need for "time for teachers to familiarize themselves with new materials and methods and to reflect and work on problems of implementation, both individually and collectively" (p. 84).

According to Smylie & Conyers (1991), teaching has long been conceptualized as a production or factory model, resulting in staff development based on a model of individual deficiency. Teaching is now coming to be viewed as a collective enterprise and teachers will need to work and learn together in order to be successful in classrooms and within school systems as they implement

initiatives.

Staff development cannot be looked at as an independent variable. According to Bennett, Rolheiser-Bennett & Fullan (1990) teacher development is closely linked with classroom improvement and school improvement. To separate these three elements is artificial and counterproductive. When the teacher is viewed as a learner, the teacher needs to possess a technical repertoire, must be a researcher into new and better ways, must be able to reflect on practices, and must be able to collaborate with others. These four factors are interrelated and the degree to which a teacher is adept at all four determines the degree to which the teacher can function as a learner.

There is also a need for collegiality, a sense of shared purpose, a commitment to continuous improvement, and a willingness to consider structural issues. If staff development is to be maximized class improvement also needs to be considered. Key variables within this component are mastery of the content, knowledge of instructional strategies, the ability to utilize a variety of instructional skills, and the ability to handle classroom management (Bennett, Rolheiser-Bennett & Fullan, 1990). The implications of such a view of staff development for those striving to implement educational change is that we must address all of these components if we are to maximize success.

Those individuals and groups who are to implement the innovation need to be involved in meaningful decision-making about the innovation and the innovation plan. "Change is too important to leave to the experts" (Fullan, 1993, p. 39). All teachers have the responsibility to "help create an organization capable of individual and collective inquiry and continuous renewal, or it will not happen" (p.39).

Resource Support

Closely tied to the issue of inservice is that of resource support. Studies indicate that "resource outlay or initial investment can often be used to predict implementation" (Fullan & Pomfret, 1975, p. 84). Teachers and principals at the ground level "often do not experience the presence of significant new resources" (Fullan, 1991b, p. 8). Resource availability over both the long term and short term are important to the health of an implementation effort, particularly one such as the science program, which has at its center a resource-based, activity oriented program.

Time-lines

Time perspective is one of the most neglected aspects of implementation (Fullan, 1982). Time-lines need to be long enough to be realistic, yet not so long that the impetus for action is lost or minimized. In some ways the all at once versus the piecemeal dilemma is a strength versus endurance dilemma. "The all-at-once approach requires administrator-teacher relationships that are strong enough for administrators to activate, focus, and support the requisite teacher effort. The piecemeal strategy requires that administrative attention be sustained over a long time span" (Crandall, Eiseman & Louis, 1986, p. 37). Even when such a commitment exists, it is easily undermined by administrator and teacher turnover, as well as by pressures to deal with new issues and priorities.

Schools have many items on their agenda at any given time and one of the biggest challenges is to find time for a variety of high priority initiatives. In northern Saskatchewan Core Curriculum implementation has been a major area of attention. Core Curriculum consists of four elements: Required Areas of Study, the Common Essential Learnings, the Adaptive Dimension, and Locally

Determined Options. Core Curriculum had its origins in the early 1980's and arose as a result of public meetings, written briefs and an extensive consultative process. From this process came Directions (Saskatchewan Education, 1984) which provided a blueprint for educational reform over the next number of years.

The Common Essential Learnings are skills, attitudes, approaches, and knowledge that are considered essential in order to address student needs in today's and tomorrow's world. They include Critical and Creative Thinking, Communication, Personal and Social Values and Skills, Independent Learning, Numeracy, and Technological Literacy. These learnings are interrelated and are to be woven into the fabric of all areas of study (Saskatchewan Education, 1988).

Teachers have also been working at expanding their instructional approaches repertoire as well as at becoming more adept at various assessment strategies and evaluation techniques. Provincial foundation documents pertaining to instruction (Saskatchewan Education, 1991a) and Evaluation (Saskatchewan Education, 1991b) outline provincial expectations regarding these two areas. In addition, a foundational document has also been written and distributed to all teachers which outlines expectations and ideas regarding adapting curricula, instruction, and learning environment in order to better meet student needs (Saskatchewan Education, 1992).

Schools under study have also been involved in a provincial initiative supporting efforts to incorporate Indian and Metis content and perspectives into various aspects of education, attempting to implement the Indian and Metis Education Policy (Saskatchewan Education, 1989b). The preceding initiatives have been accompanied by an ongoing effort to move toward a whole language orientation in the teaching of English Language Arts as well as a move toward greater decentralization within the school division. School plates are indeed full and "we must put a particular innovation in perspective with the other

innovations that are being implemented simultaneously" (Sparks, 1992, p. 3).

Gathering Data on Implementation

A question to consider before and during implementation is what kind of information to collect and how to act upon this information. "There is no evidence that information on student achievement by itself results in improved implementation." (Fullan, 1982, p. 69). Information on implementation concerns is valuable as long as it is linked to some effective means of acting on it. It is also critical that attention be paid to where information is collected from. It is valuable to gather information from a variety of sources, but "it is at the school and classroom level where information counts" (p. 70).

Another issue associated with the collection of information is when to gather information. Initiators of change are often under intense pressure to provide evidence that change is taking place. Pressures arise to gather data, often on product, early in the implementation process. However, it is precisely at this point in a complex change that the individuals and the systems involved are grappling with emerging problems and challenges. Information is often gathered, but it is often premature or focused on the wrong issues and concerns. As a result actions arising from the information are often ineffective.

The Principal

"All major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change, but it also indicates that most principals do not play instructional or change leadership roles" (Fullan, 1991a, p. 76). Research indicates that effective instructional leaders are in the

minority. As an example, case studies of four school districts in Ontario known for a curriculum focus estimate that only about 10% of their principals were functioning as effective curriculum leaders. Studies show that most principals are reactive rather than proactive and that they give much more time to maintenance than to change. It is also shown that implementation often succeeded when administrators exerted strong and continuous pressure on teachers and that such pressure must be combined with effective and sustained support (Fullan, 1991a).

The actions of the principal indicate whether a proposed innovation is to be taken seriously. "One of the best indicators of active involvement is whether the principal attends workshop training sessions" (Fullan, 1991a, p. 76). Involvement of the principal in staff training provides "the information and skills needed to help teachers implement the project and sustain project activities in the face of eventual staff attrition" (Berman & McGlaughlin, 1980, p. 10).

Recent research makes the distinction between leadership and management and emphasizes that both are essential. Leadership relates to mission, direction, and inspiration. Management involves designing and carrying out plans, getting things done, and working effectively with people. "Leadership activities involve articulating a vision, getting shared ownership, and evolutionary planning. The management function concerns negotiating demands and resource issues with the environment, and coordinated and persistent problem-coping" (Fullan, 1992c, p. 85). The tendency is to label principals as either one or the other. However, "successful principals and other organizational heads do both functions simultaneously" (Fullan, 1991a, p. 158). Whatever their style, effective principals seem to focus on "active leadership, motivating staff, motivating students, reaching the community, and continually improving the school" (Fullan, p. 159). Above all, school leaders need to know and understand the change process" (Fullan, 1991b, p. 15).

A number of realities often complicate a principal's ability to nurture change. Just as teachers need time and interactive opportunities to internalize a change, a principal also needs such time. However, innovations are often introduced in a setting where time and situation make open statements such as "I don't understand it" inappropriate. "Just as ongoing assistance to teachers is crucial, so is ongoing assistance to principals" (Fullan, 1985). Interactive opportunities for principals are often less frequent than they are for teachers and it is often not deemed appropriate to share these "principal concerns" with fellow staff members. The principal is also in the middle of a very complicated change process which he or she may have little or no training to deal with. Commonly the person charged with responsibility for bringing about change may know little about the nature, processes and roles inherent in change of any kind (Fullan, 1991a).

The Teacher

"Change stands or falls on the motivations and skills of teachers. When one attempts to define the essence of change the focus inevitably zeroes in on the teacher" (Fullan, 1991b, p. 1). Both characteristics of the individual teacher and collegial factors have an effect on implementation. The culture or the climate of the school can shape an individual's attitude toward change (Fullan, 1991a). Relationships with other teachers is critical, given that change involves learning to do something new and interaction is at the root of this learning. The development and refinement of new knowledge, skills and beliefs depend on whether teachers are working as individuals or whether opportunities exist for interaction. "The quality of relationships among teachers is strongly related to implementation" (p. 77). It is also important that there be "teacher participation in decisions concerning project operations and modifications" (Berman & McLaughlin, 1980, p. 9). When significant teacher input is present "the staff were

more likely to invest the considerable energy needed to make the project work. The project, in short, was 'theirs' " (p. 9).

The Student

An often forgotten player in the change process is the student. "Student expectations are a neglected yet crucial aspect in relation to the success of some innovations" (Fullan, 1991a, p. 183). Curriculum innovations vary in terms of how much change is involved for students but all innovations "involve something new for students" (Fullan, 1991a, p. 183). Fullan summarizes the subject of student involvement by stating that teachers should "blend education and change, periodically discuss the meaning of activities with students, work on the skills students need to participate in new educational reforms, and consider the relationship between old and new" (Fullan, 1991a, p. 190).

External Factors

This last set of factors attempts to place the innovation into the context of a broader picture. Although this last category forms the broad context for the operation of the other three types of factors, it is important, most notably in large scale reforms. In many cases the sponsoring and adoption of complex reforms are political acts. In most cases once a political decision is taken, efforts are made to obtain as many adoptions as planned for in as short a time as possible. However, this is usually accompanied by inadequate time being spent on the implementation of the innovation (Fullan & Pomfret, 1975).

In Saskatchewan the term external factors refers primarily to the provincial Department of Education, Training and Employment, although it also may refer

to other organizations such as the Saskatchewan Teachers Federation and the province's two universities. Government agencies have traditionally been preoccupied with policy and program initiation and have often neglected realities of implementation. Herriott & Gross (1977) observed that "the difficulties which some school districts encounter in their change endeavors partly arise because of problems in their relationships with the agencies that support them" (p. 6). What is critical to successful implementation is that the subjective worlds of the key partners are often very different. "To the extent that each side is ignorant of the subjective world of the other, reform will fail" (Fullan, 1991a, p. 79).

What is critical is that a strong "processual relationship" develop (Fullan, 1991a, p. 79). A process is needed to enable the various partners to work together to deal with the challenges of implementing a complex initiative. "Central policy makers should not assume that their responsibility ends once adoption takes place. They need to establish ways of facilitating coordination between different agencies during implementation" (Fullan & Pomfret, 1975, p. 114).

Concluding Remarks

Fullan and Miles (1991) outline several basic reasons why reforms commonly fail. Often one is that we have faulty maps of change. Everyone involved in school reform has a personal map of how change proceeds. We act on our maps but such maps do not always provide reliable or valuable guidance. "A good map has to be a valid representation of the territory, or we won't get where we are trying to go" (p. 4). Another reason why reforms commonly fail is because the problems are far more complex than we realize and than we are prepared to deal with. We also must not allow pockets of success to die out--we must nurture, support and publicize living examples of success. Finally, we must not misuse knowledge of the change process: selectively pulling out key ideas or

using catch phrases which suit our aim, excluding other factors which do not fit our plan.

Fleming(1987) suggests that in order to manage complex change a variety of factors must be attended to. Vision, skills, incentives, resources, and action plan are all important. If any one of these components of complex change is not attended to results can be predicted. If all components are attended to with the exception of skills, the result is often frustration on the part of the individual dealing with the innovation. If an action plan is lacking, false starts are common. A complete version of this conceptual diagram, used in a variety of provincial government documents, can be found in Appendix E.

Several propositions for success are put forth by Fullan and Miles (1991). Whatever map of change we put together should take these propositions into account. Change is learning. As such it is loaded with uncertainty and we must not deny the needs of others to grapple with their uncertainties. No plan, however well thought out, will be able to totally eliminate uncertainty. "Learning, anxiety, difficulties and uncertainty are intrinsic to all successful change processes" (p. 13) and a risk-taking climate is critical. We also need to view change as a journey, not a blueprint, since rational planning models for complex social change do not work.

When seeking to understand educational change we also need to accept the proposition that problems are our friends. "Problems are endemic in any serious change effort; both within the effort itself and via unplanned intrusions" (Fullan, 1993, p. 26). Too often change-related problems are "ignored, denied, or treated as an occasion for blame and defense" rather than as "natural, expected phenomena" (p.26). Avoidance of real problems is "the enemy of productive change because it is these problems that must be confronted for breakthroughs to occur" (p.26).

Data were captured on audio recordings for future use. As a first step toward analysis I transcribed all interviews, and printed all interview data on three different colors of paper, a separate colour for each of the three sites. Using the floor of the family cabin as a work area, I proceeded to sort interview transcript segments into piles of common concerns. Categories such as northern factors, curriculum guide usage, teacher education, communication, and principal's role emerged--a total of twenty-five distinct areas of concern. Some categories were folded into others while in other cases areas were broken down into sub-categories. Each "pile" of concern areas was then analyzed and organized. Files, clips, boxes, scissors and glue became important tools of analysis as the data gradually became coherent. As writing proceeded the data was shaped into a presentable form which became my "Findings" chapter.

Initial attempts at drawing conclusions and tying my findings to other research were frustrating since it was difficult to find a framework for analysis which was structured enough to help draw meaning and sense from the data, yet was open enough to retain the life and local flavour of the interview transcripts. Eventually I decided to utilize a framework for analyzing change originally developed by Fleming (1987), and used in several government curriculum support documents. This conceptual diagram, included as Appendix E, assisted me in efforts to integrate my findings into a more general framework on change. My efforts to tie my findings to this framework and to the literature on change became Chapter Five.

My research focused on three sites: Dennis Gorman School, Thunder Ravine School, and Electric Falls School. A total of thirteen interviews were conducted with teachers and administrators within the three schools. The names of all schools and individuals within this study have been altered in order to help ensure anonymity.

Dennis Gorman School:	-grade one teacher	-Agnes
	-grade three teacher	-Darlene
	-grade four teacher	-Maureen
	-grade five teacher	-Jack
	-principal	-Lennard
Thunder Ravine School:	-grade three teacher	-Violet
	-grade six to nine teacher	-Jordan
	-principal	-Janine
Electric Falls School:	-grade two teacher	-Liane
	-grade four teacher	-Hal
	-grade five teacher	-David
	-principal	-Ron
	-vice principal	-Kerry

At each site a teacher was selected from both the upper and lower end of the elementary range to avoid a grade range bias in the research. Principals were involved in all three sites to ensure that their perspectives and roles were included. Such inclusion is in line with research indicating the importance of principals in implementing change. Interviews were conducted at the school site at a time and location desired by the respondent. The following chapter is a synthesis of data gathered from the teachers identified above.

CHAPTER 4: FINDINGS

Introduction

Teachers raised a number of points regarding the implementation of the elementary science curriculum. Many of their views echo findings by such authors as Fullan. These points I have identified as "generic" since they apply to almost any situation. I summarize these points in a few pages and do not discuss them further. This chapter concentrates on factors unique to Saskatchewan, particularly those which are uniquely northern.

Visions of Science Education

Teachers from all three schools were in general agreement as to what constituted sound science teaching and learning. Educators described a learning environment where inquiry was encouraged. Learning should be a hands-on experience with students "busily trying something out." Ron hears a "fairly noisy classroom that was not chaos." According to Janine you would have a learning situation in which you would hear "a lot of kids talking to each other, teaching to each other. The teacher--you wouldn't hear very much from the teacher."

Teachers would be adept at a variety of instructional approaches, with particular skills at facilitating cooperative learning. Teachers would be enthusiastic, supportive facilitators of learning who model a joy of learning and a spirit of inquiry. Science learning would be an exciting multi-sensory experience rich in sound, texture and complexity. One teacher described the ideal classroom as a "hive of industry" and saw students all "busily trying to find something out. You would walk in and see all this activity."

The ideal science learning environment should be expansive. The classroom was described by Hal as a "convenient place for rainy days or isolated studies." Teachers saw science as "all around us." Where science is ideally taught and learned should depend on what you are doing. "If we were doing rocks it would be stuff from around the community. We would be collecting our own materials and bringing it in or going out and doing it."

Violet, a grade one teacher, envisions outdoor learning for even the youngest students. "You can go outside. You can take them on nature walks, look at the birds and that and maybe go into the bush and see where the little rabbit trails are. See where the birds make nests." Violet also sees outside learning as possible in all seasons, "even in the wintertime."

Teachers credited a variety of individuals and situations for their vision. For Hal, a self-described "learning creature", it just "comes biologically." Most of Hal's life has involved "trying to find out why things are the way they are." Kerry grew up at a lake and credits that situation for her view of science. Others credited experience--some of it in northern settings. Agnes found that "they are learning a whole lot more by doing than by watching." Liane credits her early experiences in the North. "I've been here for sixteen years. When I first came up I took kids out camping. That was our holiday and I turned it into a learning experience. We brought in elders and we did bush studies, we did tree studies so that we went out looking for different kinds of trees and then we went into medicine studies. You could see that there was far more learning when the kids were active participants than looking at you. You can see it go over their heads. If you are sitting there and you are trying to push facts at them, forget it."

The majority of teachers presented a vision of science teaching and learning that was very close to the vision as outlined in the provincial curriculum. However, of the thirteen individuals interviewed, only two teachers felt that their

vision was close to becoming reality. One of these teachers possessed a vision of science teaching and learning differing substantially from that expressed in the curriculum--describing the educational process as "chipping away at this student getting the rough edges off and as he moves through the system by grade twelve hopefully he will have a finished piece of work."

Maureen, on a scale of zero to ten, rates her degree of implementation at a "three or four or somewhere in there." Violet says that she is "not really into it yet but I am getting there. I would say I am coming along." Jordan states "I have the vision but I am not quite sure how I am going to do that." Janine states "what I am doing is I am very far from it." Liane characterizes her status as "about in the middle." Hal says he is "over on that side where it's not happening."

Factors Affecting Implementation

Generic Factors

Timelines

For most teachers the process of taking science from vision to reality was a three or four year process. To Hal "It is basically a three year effort. The first year is a real struggle. You just salvage what you can out of it and try to tie these alien parts together to make something. The second year is a building on what you did the first time so it is going to be better. There is still a lot you haven't seen yet. In the third year you have a chance to tie some of that in. In the third year you feel like you are actually doing something successful. In the fourth year you get better at it."

Ron indicates that teachers at the lower grades are having an easier time

of it, primarily because they teach holistically and utilize themes. These themes web nicely into science. Teachers at that level are also a tighter group. "They plan together. They share materials together. They share their efforts together." Ron believes part of the reason for varying closeness is due to the fact that at lower grades teachers spend most of their time with their students and teach them all subjects.

Timelines for implementation are influenced by teachers' exposure to curriculum change. Teachers who had been exposed to earlier innovations seemed to respond to curriculum change more willingly and had an easier time with it. "I think you will find that the teachers who are piloting projects move through it a lot quicker" says one school principal. The ripple effect works its way through the staff. "The friends of the pilot teacher will of course be very close behind because they are sharing the stuff quite directly with them."

Most teachers spoke about the need for longer implementation timelines but Maureen cautions against erring in the other direction. "The faster the better. I say that because I think that if you let people doddle along and choose well, maybe we'll implement that next year, some places will never do it. That is not fair to the kids. I don't think you can say well he's returning next year so we'll let the kids wait another year for it."

Instruction

Several factors related to instruction are impacting on implementation timelines. One principal indicated that the move toward varied instructional approaches was a difficult one for some teachers. Just as some teachers find the approaches advocated in the curriculum to be new and challenging, so do some students. "Some teachers who are more traditional, the first time they take a risk

they have a lot of problems with the students reacting to it because all of a sudden the students may think that it's free time. Where they were used to this tight controlled environment. Now the teacher is trying to take some risks and they are just going wild on it."

An activity-based curriculum such as science necessitates a great deal of planning and organizing for instruction. Some teachers are finding this a challenge. Kerry had the following to say about organizing for science instruction and learning. "You have to have a very high level of motivation and commitment to the students and the program to spend that time organizing."

Several teachers indicated that large class size made it virtually impossible to implement the curriculum as envisioned. Hal had a clear idea as to what he wanted, and was committed to and excited about the prospect. However, certain realities got in his way. "It hasn't been good because of the numbers I dealt with. I had up to 35 or 36 students at the high point until about a month ago. This made teaching absolutely ridiculous because there were so many students that their energy and interest was all lateral towards each other socially. It was extremely difficult to get them to try to focus on anything else. Teaching science or teaching anything was merely a sideline. If that happened a little bit, well Wow!"

Kerry was frustrated in her efforts to utilize cooperative learning strategies advocated in the curriculum. "Group experiments with a group like mine, that size! I had thirty eight that attended regularly. One teacher cannot supervise properly five, six, or seven groups. If I had three that meant that I had to have ten groups going! That means that I have to have ten balloons, ten pumps, ten this, ten that, and that ends up being difficult. And then to supervise the ten groups."

Inservice and Networking

Inservice support was identified as very helpful but teachers saw such support as an introduction, with much more ongoing support needed. One teacher at Dennis Gorman stated that in-service "has helped me. Otherwise I wouldn't have had a day to sit down and sort of go over them. But a day is not enough. We need a lot more. It sort of just gets you into it."

Teachers varied greatly in their level of familiarity with the document. One teacher, when asked about the curriculum guide, stated that "we have lots of them. I don't know if there is a need for them." When asked whether or not the old science curriculum was used, the teacher replied "Yes. There is this other one. This Addison-Wesley. That is the one I am thinking about using this year." Factors and dimensions of scientific literacy, and core units were not terms familiar to this teacher. In fact, no teachers interviewed spoke on their own about scientific literacy, let alone dimensions or factors. One teacher referred to being hindered by "those horrible little numbers in there. Like go to F3 and those things." One teacher, after being introduced to the term scientific literacy into the conversation thought that "maybe I'll do a little of that now."

Many teachers indicated that it had been a long time since they had read the curriculum. "It has been a while since I read through it. Maybe I just digested the parts that fit best with what I think." Another teacher indicated that she read it "once in a while." Yet another teacher stated "I don't use the guide that much. To be honest I don't really go back and look at the guide that often." One principal indicated that "Probably two years ago was the last time I looked at the science curriculum guide." No teachers described the curriculum as a document that they used on a daily basis.

Lennard believes that if teachers are left alone without support or inservice there is a chance that "they will continue with their tried and true methods that involve standing up and saying we'll do from this page to this page and I want you to read this and we are going to do these questions instead of trying to let the kids do some exploring on their own." Janine indicated that science implementation workshops provide pressure to bring about change. "When you have to go to it and you know God forbid they might say 'where is your unit?' Someone might be checking so you read it."

Teachers spoke about the importance of opportunities for networking with other schools and the need for time to plan with other teachers in their own school. A teacher at Rocky Ravine indicated that she "would just love to go and maybe exchange with a teacher." Jordan would appreciate time for "getting together as a staff and doing some of that stuff such as cooperative learning. How an activity will work. Learning how to use that hands on exploratory learning and how fun it can be."

Parental Involvement

Lennard believes that many parents are often unaware of the changes that are taking place. "They are seeing school as they were taught. I have to start informing those parents what is happening. They want to know why they don't get a spelling test every Friday now. I have a large public that are supposedly knowledgable. They are not stupid people around here. They don't understand the changes that are being made in education right now." Instructional methods, resources, and evaluation are several areas Lennard identifies as in need of a communications strategy. Another teacher gave a similar view. "They only come here when they have concerns of some kind, whether it be teachers. Not too often do they ask about programming and I think that is important and so when

we have meetings with them we try to explain what the different programs are. But I don't think there is a large understanding in the community."

Teacher Education

Teacher education was identified as critical to the long-term success of science implementation. With Saskatchewan Education regional inservice available only during the initial implementation year, and given the introduction of new course every year, it is critical that teacher training prepare educators to deal with new programs. Agnes stated that "a new teacher wouldn't have a foggy hope unless they were familiar with the curriculum guide, to come in." Two teachers felt that their training did not adequately prepare them for courses such as the new science. Maureen had "only that basic training when you had one year of methods and one year of arts. Really nothing." Maureen did not even recall taking a science methods class in her initial training. She received some content training in courses such as geology, but recalls no training in science methods.

One principal stated that "new teachers who are coming right out of university right now or the last five years are different. A whole different kettle of fish than teachers who have been in the system for ten or fifteen years. Totally different." Teachers generally gave high marks to the Northern Teacher Education Program (NORTEP). Agnes indicated that "with the Nortep they do a lot with cooperative learning and different teaching strategies and that fits into the science a whole lot better."

Implementing Curriculum Change in Saskatchewan

Balancing Initiatives

The most commonly expressed implementation concern is the issue of balancing the various initiatives taking place within the schools and school division. David expressed it very pungently when he stated, "It's like a garbage truck coming in every hour and you are unloading that thing with a shovel. You can't keep up with the changes but you move on the best you can."

Teachers in the three schools taking part in this study are engaged in a multi-facetted implementation initiative mandated by the Department of Education and supported by the school division. Appendix F shows the implementation schedule as developed by Northern Lights School Division and the northern office of Saskatchewan Education, Training and Employment.

A number of initiatives have been on teachers' plates from the launch of science through to the present time. Jack explained the challenge of multiple initiatives quite effectively. "This is the third year for the science and I feel now that I have a comfortable handle on it. But see that is three years running. So you get it for one year and the next year you have something else coming in line and you still don't have a handle on it and you are in the second year and you are still trying to learn the first year of another one, only to come in the third year and pick up a third one. So now you are starting to feel that you are getting a handle on science in that third year but you are in the second year of something else and something else is brand new."

Maureen expressed her frustration. "It is not just science. If it was just science that would be wonderful. You could focus on it and that is where you would spend all your energy and stuff, getting things organized and know where

you are going. I really enjoyed doing Art and I really enjoyed doing music and I didn't do a lot of drama but it is interesting, and I didn't do a lot of dancing but it is interesting. But when they throw everything together I have been to the point where I hate doing art. I don't want to do music. I just want it to go away and leave me alone and I'll do my math and my reading and everything else can go away."

Agnes described the situation as "sort of like a kid in high school where one teacher will give them a thirty page essay to do this month and another one will give them a math exam that day and everything piles up and nobody knows what the other one is doing." Agnes went on to express her view of the provincial curriculum development strategy. "They got together their writers and sat in their little ivory palaces and they thought up all the wonderful things but I wish they would have gotten together with the different curriculum writers. Everyone would have gotten together and thought it through instead of each department doing its own thing."

Several teachers saw linkages between initiatives. Jordan stated that the various initiatives "kind of fall together in a sense." Hal also believes that the initiatives fit together. "Arts Education is just a means of expression, just as English Language Arts is. You can't do science without expression. You have to share your information so you are doing science but you are also doing language arts and arts in the sense of various forms of expression. There is a sense of drama involved in it." Lennard also sees linkages between the various initiatives. "It should seem now that when they get over the first hump, like get through the first curriculum, that you have so many of those damn strategies that flow from one to the other or the idea that it is involving the students, and the students are working in cooperative grouping and things like that that as they get into the next one and the next one that time should shorten."

Teachers took various approaches to dealing with these initiatives. Jack's approach to the challenge was to continue to focus on science, giving only limited attention to subsequent curricula. "The science had a start in that we did science with nothing else with it. It gave us lots of time to concentrate on that. But now the ones that we are receiving now, I don't think we are doing nearly the job that we have been doing with science. We just are not having the time when we have the other distractions." Kerry describes the approach take by many teachers as one of making choices among initiatives. "You ended up with everyone really hot on science that first year. The next year you are into art. Unfortunately, at least with visual arts when they came in you end up trying to decide which one you are going to do--one or the other."

When asked about how he dealt with the various initiatives and timelines, Hal paused, then said "What I can hold in these two hands is what I do, no matter how much they set up before me. Maybe its part of an extraction process. This is part of a three year or maybe a five year or a ten year plan that is just piled in front of you but you take out of it what you can incorporate at that time." Hal speaks about the ebbing and flowing of implementation efforts based on classroom realities at a given point in time and how this can be an important factor affecting implementation. "Sometimes such as this year, there hasn't been a whole lot of development because it has sort of been a withdrawal and regrouping because I have a different problem to deal with. It is not a teaching problem, it is a classroom management problem. So the teaching part takes a back seat to a more pressing need."

Implementing Core Curriculum is an enterprise that demands a lot of teachers. Agnes describes her efforts. "It is a lot of work because there is hardly a night when I don't cart home things and many nights I am still working on it at eleven o'clock at night after twenty-one years of teaching. It is all the extras. To familiarize yourself with things. It is time. It is too fast. Burns you out after

a while."

In some schools a conflict exists between government and school division priority list and that of the school. In Janine's school the high need area was not science. "Actually we picked Language Arts and Language Arts is not even coming in yet. But we are kind of going in reverse which is terrible but the needs of these kids are Language Arts so we have pushed Language Arts this year. We are kind of screwy but it is the only way we can survive." As for timelines "As long as Saskatchewan Education and central office understand that we are doing our best to survive, but we might not do it according to your timelines but we are getting it done. We have a plan and we know kind of what we want to do but it is just not going to get done according to your timelines. It will get done according to our timelines." For this teacher the school's local priority list takes precedence over both school division and departmental priority lists.

School Administrative Support

All administrators saw their role as an instructional leader as critical to successful implementation of curriculum change. However, all school administrators expressed frustration at the variety of factors preventing them from playing a role they see as important.

Kerry believes that it is important "to attend all of the in-services that are being given on science. I have to become as well-versed in the areas and reading about what is supposed to be taught as the teachers, to be interested in it. To show a real interest. And then once I know what is happening, to visit the classrooms on a weekly basis, so that I am in there and talking with them."

Maureen stated that principals "should always read the curriculum and

attend the in-services. And attend them attentively, not dash out and answer a phone call that comes along." They need to be "enough of an instructional leader to admit that they don't know everything, and they may have to go outside."

Kerry believes that not all teachers accept change enthusiastically and that an effective school principal needs to be able to address that. "Some teachers, no matter what you say, they are yesbutters. They are going to say yes, but I don't know if I have the time. By coming in there the pressure is put on that teacher to live up to the expectations of the curriculum."

Kerry described the principal's role as "extremely critical. If I don't care what is happening or don't know what the heck is going on. That's life. There are people who are very self-motivated but you might end up with two totally self-motivated people on a staff." In Electric Falls the role of the principal, according to Kerry, is also critical because of a lack of parental pressure. "The only real pressure is either from within ourselves or from the administrators."

Ron identifies the support role of principal as critical in instructional change. "The teachers who are more traditional have a tough time getting into the different strategies. When they have their first few failures they get turned off to it. Now my job there would be, is saying that yes, be a risk-taker, and if things really screw up just keep me informed on how they screwed up. Trying to free teachers to take some risks in their instruction."

Hal sees the administrator as a "coordinator of teachers in much the same way that a teacher is a coordinator of students." He goes on to describe the principal's role. "Their role is to have a vision of how the school should proceed and then take steps to enable teachers to progress in that direction. If there is a new curriculum initiative their responsibility is to help teachers to implement it in the way that it is envisioned. What it means is to actually see what is

happening and knowing what should happen and have a five year plan." Principals need to get involved. They need to "talk to teachers. Step into the classroom. Check it out and see what is happening."

Administrators supported the notion that a principal can and needs to play an active role in the process of curriculum implementation. All teachers interviewed also supported this notion, although for several teachers, administrative involvement was synonymous with procuring resources rather than actually getting into classrooms. However, both teachers and school administrators indicated that limited opportunities have existed for principals to play an instructional leadership role.

Maureen, although seeing her principal as supportive, believes that the principal need not be the instructional leader in the school. "I don't believe they have to be. But I think that you need to have someone who is an instructional leader in school, whether formally or informally, who can do that but it doesn't necessarily have to be the administration."

Ron at Electric Falls possesses a clear view of what role he wants to play but expresses frustration at his ability to perform that role to a very limited extent. "I've basically given too much time to administrating rather than looking after the needs of students and teachers and getting more involved in that." Ron believes that he addresses curriculum concerns and talks generally to staff members quite a bit but "didn't spend enough time in the classrooms. I walked through a number of times and it sways back and forth. That is my battle with trying to get my administrative role organized so that I can be free to do that."

Ron indicated that just as there are many things on a teacher's plate there are also many things on a principal's plate. When asked how he defined his role and how he balanced the many parts of his job, Ron indicated that in some ways

it was outside his control. "Well, you define it and it gets defined for you basically. The things that if they don't get done on time that get the most attention from central office are the ones you want to make sure you get done on time." Ron indicated that being an instructional leader in efforts to implement science is but one of a variety of tasks, and as such is one that at times gets put on the back burner.

To simply increase inservice days, while solving one problem, has the potential to create others, as teachers at one school found out. At Electric Falls the staff decided to have most of their in-service and professional development early in the year in order to "take benefit from it for the remainder of the year." Feedback came in from the community. "Gee these teachers! Don't you ever teach? You are always at an in-service. You are always doing this." In reaction to the feedback two articles were placed in the school community newspaper explaining things but, "to parents it seems that the teachers are getting a day off to have meetings and to drink coffee, smoke cigarettes and bullshit." Although teachers would like more days for in-service and professional development, too many days, or too many days bunched together, can lead to school--community problems.

Monitoring Implementation

Teachers vary greatly in terms of the degree to which they are implementing the program. Realities are as numerous as the teachers implementing the changes. Principals indicated some understanding of and concern about the extent of implementation taking place in their schools. Several educators indicated their belief that other than some informal monitoring by principals little attention has been paid to the monitoring of implementation. Hal states that "Until you came nobody has asked me in a formal way what is going

on."

Jack states that most monitoring is done by teachers themselves. "It is our principal and that would probably be the only person. Short of that it is us. How we follow the guidelines and how we do it. But there isn't anybody as such checking that out to see if we are on task here and so forth." Liane states that the only monitoring of implementation that she has seen has taken place among teachers. "The only thing is that we evaluate among ourselves. I'll say well this thing went very well but this didn't go very good. The evaluation is among ourselves." What is Hal's opinion of this situation? "I think that this is a big danger. It is a happenchance way of implementing programs because people modify things to suit their own needs." Maureen expresses the belief that you cannot leave monitoring "up to people filling out and saying yes I did this, I did that."

A principal outlined his views on the need for implementation monitoring. "Saskatchewan Education has to put out, central office or someone has to put out, or like superintendents or something have to put out well what are you doing with this one? The plan. The principal comes in and says okay this has been done and what are you going to do with it? There has to be some form of accountability. Or otherwise we go to these lovely things. Well, there is another day. And there is no follow-up. There is no accountability. Well they don't care if I am doing it or not. That is what a lot of teachers are thinking. They don't care. So now its been done, so what. Okay, well let's go back to doing whatever we were doing in the classroom. Or I'm not going to change it."

Discussion turned to a variety of stakeholders in implementing change--stakeholders such as schools, school divisions and the Saskatchewan Teachers' Federation. "They are all stakeholders and they all should be evaluating the

program as it goes along and then making changes as need be. It is one thing to come out with a curriculum." Hal sees implementation monitoring as a shared responsibility. "In the chain of process it goes from Saskatchewan Education to the division and then the division should be responsible for implementing these changes. If they are going to initiate new programs then I think that it is important that they also monitor how those programs are going. Too often new programs are put in place and you say okay that's done but really the program that is being implemented is radically different." Teachers expressed the belief that very little attention has been paid to monitoring by either the Department of Education, Training and Employment or the school division.

Teachers recognize economic restraints. David states that "They have done what they can. I know that they are under financial constraints also and you can't do everything that you would like to do but I think that they have done a good job. It is basically up to the teacher to carry the program and to make it better."

Lennard sees a need for "people need to go back and touch, to reflect, to rethink, to see things again because even though I might sit down and read these curriculums or I may read this or I may read that, unless I am working with it, it doesn't stick. But now they have been working out there with some of this stuff, if they were to go back to the Core again or back to some of the strategies, or even back to the evaluation, they may say I remember talking about that but I kind of forgot about that so it is kind of nice to be reminded about that and maybe that is something I should be working on again."

Northern Factors

Teacher Supervision

In the school division involved in this study the role of overseeing teachers and school programs is usually assigned to a Superintendent of Education. These Superintendents of Education are the key link between the school and the school division office. According to many of the participants it is critical that the Superintendents of Education be familiar with new programs since they are the individuals who are key players in teacher evaluation. "If you don't know the new program then as a superintendent I come in and watch a chalkboard lecture on science and beautiful diagrams and the kids drawing or whatever, I would think that was perfectly okay. If I didn't know that the new program that we have for science is simply not a lecture approach program. Then I wouldn't realize that here is a great concern here if I have been in three times and that is all I have seen. He is an organized teacher! He is doing good diagrams. The notebooks are clean and well-kept. I would think this teacher is on the bus!"

It is critical that the evaluation performed by superintendents mesh with the supervision done by the school administrator. "If you are moving them in one direction and they are moving in the other direction. They have to be kind of matched or on the same wavelength."

One teacher stated that it is the job of the superintendent of to "sit down with the principal and sort of make out a plan, a guide to decide okay what are you going to do and how are you going to get there? Assist the principal in planning the plan and sort of gentle reminders to get it going. And how are you going about doing it and sort of push the buttons to get it done I guess."

Any teachers who spoke in detail about the role of the Superintendent as

it applied to curriculum implementation indicated that they saw the level of focus as minimal. "Whenever I think of the science curriculum and fine arts having to be implemented I think of central office. I don't think it is coming through him. He plays a different role." Another teacher indicated that the superintendent "is not up to date on all of these curriculums. He knows that the Language Arts and the science and the arts are coming in but he doesn't know all the ins and outs and you can't expect him to." Another teacher described infrequent visits of short duration. "They are in here so few times, maybe two, three times. He never was in there when I was doing science. I think he came in there once and I was doing language arts. He was busy observing the newer teachers." Another teacher stated that their superintendent did not focus on implementation. "They come in and do a type of evaluation, whatever you are doing. But they don't really focus on any specific." Another teacher talks about general expectations. "He assumes that I am doing it but he doesn't make any, or specifically ask how it is going in science. He just assumes that it is getting done. If I have problems I am supposed to go see him."

A teacher in one school made reference to distance and the cost of travel as a deterrent to regular, lengthy classroom visits. One principal expressed gratitude that their Superintendent had not been constantly peering into things. "One of the things I have been thankful for is that I don't have superintendents walking into every room and saying 'Show me where you are right now in your science curriculum. I want to know exactly what you are doing with your strategies for your language arts and how much of this Social Studies curriculum have you tried?' In that way although it can be viewed as supporting it, it is in fact supporting the fact that the teachers have the professional ability or the professional confidence for them to be professional and to do what they have to do."

When asked about the implications of this position this principal spoke

about his own role. "The implications are the fact that not all teachers are as professional as they should be and some of them lean back on their old ways of doing things and won't try or take the risk to get themselves involved. Then it is my job I guess, to push them, as gently as I can, because I don't want to upset people, but to try and get them involved to do what is necessary."

As a result of limited involvement by the Superintendent of Education these expectations have been placed even more heavily on the shoulders of principals. Principals are having difficulty fulfilling these expectations.

Altered School Year

One of the schools under study operates under an altered school year. School days are lengthened slightly to make it possible for school to close early in June. Schools have the option of closing earlier if they submit a proposal, including a strong rationale, to the Department of Education, Training and Employment. In several northern communities students move from settlements to summer camps on rivers or lakes. Many teachers note a drop of between 30% and 70% in attendance once the first week of June arrives. Because of this, many northern teachers work hard to complete the majority of programming by the end of May, even if they have a standard school year, simply because they know that attendance will drop off drastically. According to several teachers in the school, the altered school year creates challenges in terms of implementing the science curriculum. A shortened school year makes each inservice day a larger portion of the overall instructional allotment. This makes it tough to get through courses, but also creates a heightened awareness of days when teachers are not teaching students.

Early dismissals are not an easy solution. "If you cut your day off earlier

you are already done June 4, so having staff meetings and other meetings after school and cutting a half an hour or an hour off of school so that we can have a meeting to implement all this curriculum or whatever takes more time off your day, so that the kids are losing more time. So not only are they losing a whole month of school, but they are also losing it because you are taking an hour on Tuesday." Having meetings after school is an approach that can be used to avoid early dismissals, but this, too, has its down side. When the day is longer to start with, adding on to it makes for a very long day for teachers and sometimes results in sessions that are not particularly productive. Janine explains it quite succinctly. "Because we go to four o'clock and so teachers are nuts, they are tired by the end of the day. They want to go home."

Teachers at Rocky Ravine also find that at the very time of year when outdoor activities advocated in curriculum guides and resource books are most appropriate and enjoyable, school closes. "When do you go out and do pond studies? Usually when there are ponds. And there are ponds in June. The frogs are chirping then. Right now, in late May, there is still ice. Jordan echoed similar sentiments. "We have a wealth of natural resources for that type of learning up here. Being where we are. But to be able to utilize those resources is difficult. You are taking about wildlife. The pond exploration and water exploration. It is fantastic up here. You have the rapids, you have the fast running water, you have the swamps, you have the muskeg, but to utilize those resources is difficult because the school year ends in June. As well as in the fall, having only a month in the fall before everything is gone again."

Teacher Turnover

In a program such as the new elementary science, which requires a variety of resources and extensive planning, teacher turnover can be a major factor. Over

the last 6 years the school division involved in this study has had to deal with on average a staff turnover rate ofapproximately 10%. This figure is substantially lower than figures for earlier years. In the case of the schools involved in this study, a lack of staff turnover was a factor operating in favour of curriculum implementation. "We have been lucky in the north. We have had schools with everyone staying. This is our third year that we have all stayed. We are lucky. If you had come three years ago and asked us the same questions you would have gotten completely different answers because this is the first time that they have had such consistency. Next year is going to be interesting to see what happens. Here and up the river road. Teacher turnover is a huge factor up here."

The teacher turnover issue is closely tied to planning. Planning for the implementation of the new science program is labour and time intensive. A teacher is more willing to make that extra commitment to long term planning if they know they will be there next year. According to Kerry planning is more effective if teachers "look upon it as preparation for next year and say that I am preparing this for next year. I have this now. I have all these pieces of equipment and I will have all this prepared and then next year I'll have it." They need to "think of it as investing. If you gather up all the balloons and the candles and the jars that you need for this unit on the air and you have it in the box, it is there for next year. You have it!"

According to Kerry, even though her school is not facing massive teacher turnover, long term organizing is not taking place to the degree it should. "You can't make people do things if their heart isn't into that organizing part." According to Kerry many teachers "really put a lot of time in here but a lot of it is not effective time because they are just preparing for tomorrow rather than realizing that they can prepare for next year and not have to worry about a lot of things."

Funding

The school division is given high marks for its support in the area of financial resources. Lennard states that "they are doing the best they can with what they have but it because, kind of, I guess the term to use is a fad type of thing. When it is in vogue then that is where they are pushing and when it kind of goes then it is kind of let go and left to the school. Which I guess is okay, but the teachers are still floundering with all the material that is there." The School Division, as well as teachers, are dealing with the implications of a multi-faceted implementation plan spanning several years.

Teachers spoke very positively about several school division initiatives aimed at assisting with curriculum implementation. Janine made reference to the hiring of science consultants as valuable. Janine, as well as other teachers, identified funding for networking opportunities as very helpful. "This Core Networking was one of the best ideas that they have right now. For us to do that, that is the biggest support for us in the north because we can get together and we can share all our ideas. We are from different communities but we are all northerners. That was the best thing that the division gave us this year."

Special Programs

All schools identified a school division supported science fair as an extremely important factor assisting with implementation. The science fair idea had its roots in secondary science piloting and implementation. The initiative moved to the elementary level due to the fact that the organizer of the high school science fair and two teachers from Dennis Gorman School were good friends. Lennard describes the process as "incidental networking." This incidental networking eventually led to a division-wide elementary science fair, funded as

I don't see it for at least another ten years."

All the schools studied are trying to find ways to overcome the gap between school and community. Janine saw it as a ten year strategy. Jordan spoke about tackling this deep rooted problem by focusing on trying to change the way students view school--students who will become parents of students themselves. "If you can show the kids a good time in school they are going to change their attitude toward school. If as a school and as a division and as a staff we can make the school fun and the kids doing constructive fun then attitudes will change toward the school."

At Electric Falls a major effort has been under way to improve the home-school relationship. Looking back over the last year, Hal doesn't believe it was that difficult. What it took was a decision to get teachers out of the school and into the community. The staff of Electric Falls embarked on a campaign of home visitations. Since parents wouldn't come to the school, the school went to the parents. Hal found that parents wanted to talk about their kids and their life. The focus of home visits was not the teacher-parent relationship but getting to know each other as people.

Teachers at Electric Falls tended to be viewed as distant figures. "By going into the home you kind of break that down a bit and they see the school as having people working in there who are people with whom they have a common linkage." Hal claims that "up until this point teachers have been alienated. They popped in and took off again. Typically teachers in this community come, they spend two years maybe three years then they are gone. Expecting you to go next year. They never do get to know the teachers except as transients who come and make money and take off again."

Northern Adaptation of the Curriculum

Agnes found the adaptable nature of the curriculum to be very conducive to use in the north. "It is more open ended so they can go to wherever they are able to go. With doing the plants and animals one, we used a lot of northern animals that they were familiar with."

Students' background can add a great deal to science. "If we are talking about science it adds a lot to it because they have a lot of background knowledge being that they live close to nature and are interested in it and have parents usually who are interested in the fish or whatever." Agnes indicated that the first year she "followed it actually a whole lot more closely and it was basically lock step." As time went on, she adapted more freely. "We familiarized ourselves with the guide, making sure that you had everything in it that you were supposed to into your lesson so you know what is expected. You are to pick from the various areas. I just chose some of those units with the kids and said what should we study?"

Janine used the guide extensively when planning but adapted it considerably. "They have great ideas in there but you can't always do them here. You have to adapt them to where you are." When asked to elaborate, Janine went on to describe how a harvest theme had to be modified. "You can't do that up here. They don't have a clue what you are talking about having to do with harvest. So you might say harvest up here. When I think of harvest I think of farming. Up here you could take it from a northern point of view." Another teacher states that "If you are doing something on plants or trees and you talk about maple trees, any kid here is just going to stare at you. You should maybe change that to a jackpine or a white spruce."

Jack sees a lot of room in the curriculum for bringing in northern materials.

"For example I know one section that deals with agriculture and one of the suggestions is to look at things such as wild rice farming in the north as opposed to farming in the south. There is some room there." Violet likes to start with northern animals. "You get them motivated. What the kids are more familiar with first. They are more familiar with northern animals like caribou, rabbits, rats, and birds. Then you can bring it more to the domestic animals. Of course they don't know what domestic animals are here because all they have here are dogs. They don't have cattle, chickens and farm animals and that. I don't think they have ever been to a farm or ever touched a horse or a cow or seen chickens. There are kids in my class who have never seen chickens."

Violet sees plenty of opportunities in the new curriculum for integrating local culture. "You could bring in a piece of hide and show them how you tan it and use it and then they could explain to the kids that this is what was used at one time when there was no shoes. Then there are things you can do with hides too. They could make little drums or they could do a little beadwork on it. Or even tufting with hair." When teachers strive to bring a cultural component into science teaching, the issue of poor community-school communications becomes a problem. According to one teacher "there are a lot of people here who could give you a lot of native culture like telling stories, sewing, tanning hides, cutting dried fish, but it just doesn't happen. Why do we want to go there?"

One principal expressed frustration at trying to incorporate Indian and Metis content and perspectives yet is uncertain about whom to contact and what exactly to work towards. "We need some of the native people to take some leadership in this area to show us where to go. We also kind of have to see what the end product is. We are working toward something that nobody knows. It is so vague. Sometimes the vagueness is nice because it lets the people explore, but on the other hand if it is too vague people are afraid to take the risk to do the

exploring." The principal then went on to give us an example of being criticized for teaching Cree legends--"They are too scary!"

English as a Second Language/Dialect

Most students in the three northern schools studies have English as a second language or dialect. English as a Second Language students enter school speaking a language other than English. In the case of the three schools under study the languages such student speak is Cree or Dene. English as a Second Dialect students have parents who speak English but grandparents who speak only Dene or Cree. Such students commonly enter school with language patterns unique to such situations. Both of these situations create unique challenges for teachers. In many schools in northern Saskatchewan both ESL and ESD students, as well as students for whom English is the only spoken language, work together in the same classrooms. To some teachers the hands-on, experiential nature of the new science program helps teachers deal with challenges associated with students for whom English is a second language. The issue of language does impact on science a little bit "but not so much because they are doing and they are seeing. What they are talking about is what they are doing and you can tell them a term and it has some meaning to them. It is not abstract as a lot of the language arts is."

Liane made mention of challenges in implementation arising due to the varied reading levels of her students and how year to year variations create certain challenges. "The grade two class I had this year were non-readers. They had no reading ability what-so-ever. Last year I had twenty-seven and again it spanned from a third sort of at a beginning grade one level, and another third were well on into grade one." These varied levels made it necessary to incorporate science concepts into thematic units. It also made hands on teaching

a necessity. "They don't have the concepts and they are still at a readiness where hands on fits their needs but to actually to sit and discuss concept they are not there. It is sort of above them. I found that I needed far more hands-on with the kinds of children I had."

Socioeconomic Factors

One teacher struggled to put classroom reality into words. "The environment here isn't like it is in the southern part of the province or in the major centres where parents have a higher education than what we do on the average. If the people around you aren't interested in finding out more things then you tend to adopt that pattern as well." This teacher goes on the describe the home reality of some of his students. "If you look at a hierarchy of needs. If you are struggling with meeting your more basic needs you aren't reaching out and wondering about why leaves are green or why that bug is doing this thing. You are worried about the next meal or staying warm, or a drink--something." In this teacher's school students do not always place as high a priority on curriculum objectives as does the teacher. Other needs such as safety, shelter, or self-esteem take precedence. Some students are too hungry, tired, or worried to concentrate on the tasks at hand.

In one community the teacher expresses the belief that kids struggle to assert their identity. What troubles this teacher is "the teasing and interpersonal put downs." In a situation such as that "what you are going to be most concerned about is what is somebody going to say to you, or defending yourself." The focus is on internal considerations, rather than on something the teacher sees as having eventual significance or usefulness for the student. "It's damned hard to marvel at the structure of a leaf or something if you're hurting inside." Factors such as socioeconomic realities have a great effect on student attitudes and behaviours

and therefore on curriculum implementation. As teachers put it on several occasions, "things are different here."

Conclusion

Teachers in the three schools under study seem to be experiencing challenges to implementation which could apply almost anywhere in Saskatchewan. Such challenges as trying to balance a variety of provincial, and local initiatives, although significant and warranting attention, are likely not unique to the north. Other challenges such as a long-standing distance between community and school, or little opportunity for networking, arise from uniquely northern historical, cultural, or geographic realities. In the next chapter I will explore these factors further.

CHAPTER 5: INTEGRATING FINDINGS WITH CHANGE LITERATURE

Introductory Statements

Managing complex change involves attending to an array of variables. As outlined in Chapter Three, I had difficulty finding a framework for analysis which provided structure, yet was open enough to retain the life and local flavour of the data. I finally came upon a diagram originally developed by Fleming (1987), and included in several provincial government curriculum support documents. This conceptual diagram, entitled "Managing Complex Change" provided me with five focus areas which corresponded to my data and is included as Appendix E. I will utilize these five focus areas of vision, skills, incentives, resources, and action plan as I analyze variables supporting or hindering teachers as they implement the elementary level science curriculum. During the course of my analysis I will focus on factors which are unique to the northern context.

Change is personal and complex. Seldom can one variable be identified as singularly responsible for successes or challenges in the implementation of an initiative. Change is more likely to take place for those who possess a clear and accurate vision, possess or are enhancing requisite skills, see valid reasons for making changes, have access to necessary resources, and possess a clear and reasonable action plan. In the following paragraphs I will examine each of the five variables as they pertain to the implementation of elementary science in three northern schools.

Vision

Visions of Science Teaching and Learning

Vision refers to what educators see as the goal of their efforts and what they see as the route to its achievement--what could be referred to as a map of change. Visions are critical to a thorough analysis of curriculum implementation since vision provides a map of change for individuals and institutions. The Department of Education, Training and Employment has a vision of change for elementary science--a vision outlined within the curriculum. Teachers also have visions as outlined in my research. School division personnel such as Superintendents of Education also possess a vision.

There is no guarantee that visions will be similar. The existence of conclicting visions or even the existence of uncertainty as to the visions of others can influence implementation efforts and results. Most teachers articulated a general vision of science teaching and learning that was very close to that presented within the pages of the science curriculum but as discussions progressed beyond the initial vision, aims, and goals of the program to specific components, clarity of understanding was at times lacking. Few teachers felt that they had moved very far toward turning that vision into reality and several expressed uncertainty as to whether the visions of others such as principals and school division personnel were in line with their own.

Clarity can be elusive. It is very easy to look at a proposed change and identify what seems to be its essence. However, entry level understanding and lack of experience working with the innovation may lead to erroneous or only partially developed understandings--what has been called "false clarity" (Fullan, 1982). Data indicate that for several of the teachers this may be the case. One teacher, when asked about the curriculum guide, lamented that "we have lots of

them. I don't know if there is a need for them." When explored a bit further it became apparent that this teacher equated resource books and texts with the curriculum. When asked whether or not the old science curriculum was used, the teacher replied "Yes. There is this other one. This Addison-Wesley. That is the one I am thinking about using this year." Further efforts to move the discussion into specific details of the curriculum guide were futile. Factors and dimensions of scientific literacy, cornerstones of the new curriculum, were terms unfamiliar to this teacher.

No teachers spoke on their own about dimensions or factors of scientific literacy. One teacher referred to being hindered by "those horrible little numbers in there. Like go to F3 and those things." Another teacher, in a different school expressed a longing for a curriculum that could be "built on timeless principles." He went on to define "timeless principles" as "things like time and eternity, infinity principles, difficult principles and those types of things", similar to principles identified within the curriculum as Factors of Scientific Literacy. In another school, after I introduced the term scientific literacy into the conversation a teacher thought that "maybe I'll do a little of that now." Few teachers illustrated a detailed understanding of the curriculum.

Most teachers I spoke with who were familiar with and who understood the curriculum did not utilize the document on a daily basis as an aid to planning and as a source of specific ideas for instruction and assessment. Most of these teachers looked at the curriculum guide as a general articulation of a philosophy of science teaching and learning which either confirmed or challenged their existing beliefs and practices. Hal at Electric Falls "just digested the parts that fit best with what I think. When I read through it I said yet this is all sensible and appropriate stuff. But I leave it on the shelf. There are a lot of things in there." Hal found the document to be something which outlined a vision of science teaching and learning he believed in. "I ended up falling back on how I approach

the world and I look at the science curriculum and say there's a compatibility there. I can feel somewhat confirmed because we have this correlation with the science curriculum."

To Hal and several other teachers, utilizing the document on a regular, daily basis is too cumbersome. "If I was to document everything I did and justify it and say these are the concepts I am covering and this is how it matches up, then it becomes really unwieldy and cumbersome." Most teachers found the outline of approach to science teaching and learning to be useful as a framework, looked through the suggested activities and used a few of them, and used the references to key resources as a short-cut to identifying relevant sections of print resources possessed by the school. No teachers made reference to Dimensions or Factors of Scientific Literacy. My research indicates that very few teachers used the curriculum guide on a daily basis for detailed support.

The question of how curriculum guides are used is one which warrants further investigation. Substantial investments of time and money went into the development of curriculum components which few teachers seem to use. Either there needs to be a reassessment of what curriculum guides should be, or more comprehensive measures to support implementation need to be put in place so that teachers make use of components of the curriculum deemed by writers and developers to be critical to the integrity of the program.

Managing Components of Change

One teacher provided a very colourful and perhaps aromatic description of his vision of managing change when he stated, "It's like a garbage truck coming in every hour and you are unloading that thing with a shovel. You can't keep up with the changes but you move on the best you can." The answer to

managing complex change such as the elementary science curriculum, embedded in Core curriculum, is to "break complex changes into components and implement them in a divisible and/or incremental manner" (Fullan, 1991a, p. 72). If one can do this, while still managing to present the components as parts of a logical and readily apparent whole, then complexity need not be a barrier to implementation. Very few teachers, including the teacher quoted here, possess a vision of the implementation of specific curricula as part of a logical and readily apparent whole.

A number of items have been on teachers' plates from the initial launch of science through to the present time. Initiatives focusing on Instructional Approaches, Common Essential Learnings, Whole Language, Indian and Metis Staff Development, and Student Evaluation are under way. In addition, teachers are working their way through a multi-faceted curriculum implementation plan mandated by the provincial Department of Education, Training and Employment, and supported by the school division. Many teachers expressed frustration with this cornucopia of initiatives and indicated that they were struggling to manage the complex changes they were dealing with.

Several teachers indicated that various initiatives did "kind of fall together in a sense." Hal believes that "Arts Education is just a means of expression, just as English Language Arts is. You can't do science without expression." Lennard also sees linkages. "You have so many of those damn strategies that flow from one to the other or the idea that it is involving the students, and the students are working in cooperative groupings and things like that." Those teachers who are successfully managing change are approaching innovations in this way--linking common threads and seeking out common messages contained within the various initiatives. However, such teachers are few and far between.

Maureen's expressions of frustration are more in line with most teachers'

responses. "There is so much coming at me all the time and there are so many people saying well this is what you should be doing and you can't do everything. You simply can't do everything at once." Maureen, and several other teachers, are a considerable distance away from seeing various initiatives as part of a coherent, logical whole that makes sense.

Innovations seldom make the teacher's job more manageable. "The main problem in North American education today is not the absence of or resistance to innovation, but rather the presence of too many ad-hoc, fragmented, uncoordinated changes" (Fullan, 1991b, p. 5). Several educators interviewed, primarily administrators, saw the interlocking nature of various initiatives and did not see initiatives as ad hoc, fragmented and uncoordinated. These people see how assessment and instructional initiatives support new curricula. They also see how messages contained within various new curriculum guides are similar. However, to many teachers these small comforts are lost in the reality of dealing with new curriculum documents, new resources, and in the case of science, a hands-on inquiry based, activity oriented program that is a departure from accepted practice.

Several teachers and administrators interviewed in this study have indicated a need to reflect on where the various initiatives originated, how the pieces fit together, as well as a need to reflect on growth that has taken place, and to address emerging needs. There is a need for "time for teachers to familiarize themselves with new materials and methods and to reflect and work on problems of implementation, both individually and collectively" (Fullan & Pomfret, 1975, p. 84). Perhaps there is a need to start focusing on what is similar in addition to what is new and different.

Teachers also expressed views as to how long the journey from vision to actuality should take. One teacher explained the process as a multi-year initiative.

"This is the third year for the science and I feel now that I have a comfortable handle on it." Other teachers expressed similar sentiments and saw complete implementation as an achievable goal within three or four years. School, school division and government implementation and maintenance plans need to take into account these time-lines and ensure that they do not assume that implementation is a done deed after a one year focus.

Shared Visions: Principals

Though degree of understanding of the science program varied from individual to individual, administrators knew what to look and listen for when they stepped into science classrooms. The vision of the program itself was there but few felt able to put their vision of instructional leadership into action. In many cases implementation succeeds when administrators exert strong and continuous pressure on teachers, accompanied by effective and sustained support (Fullan, 1991a). Ron indicated that being an instructional leader in efforts to implement science is but one of a variety of tasks, and as such is one that at times gets neglected.

A variety of views of instructional leadership exist. Earlier research tended to see principals as either leaders or managers. More recent research indicates that effective principals are adept at both leadership and management functions and that management for change has been underestimated. Contemporary management skills associated with implementing change "require skills and abilities just as sophisticated as those for leadership" (Fullan, 1992c, p. 85).

A contemporary view of the role of the principal is that of a designer, a steward, and a teacher. As a designer a principal needs to be able to design, not programs or master plans, but learning processes. An effective principal needs

to be able to design processes whereby teachers can deal productively with issues they encounter. Principals also need to be stewards--to "seek and oversee the broader purpose and direction of the organization" (Fullan, 1993, p. 71), but able to revisit their vision in light of learning about the visions of others within the organization. As a teacher a principal does not teach other people one's own vision, but rather has the ability to put expression and form to visions so that they are clear and open to challenge and improvement (Fullan, 1993).

To be an instructional leader is indeed a challenging task. Few principals have the training or the time to fulfill even a traditional instructional leadership role. Teaching expectations made of principals, a lack of training in how to manage and support complex change, as well as the placement of curriculum implementation amidst a range of other items, has had the effect of limiting the degree to which principals can put their visions of instructional leadership into action.

Shared Visions: Community

Schools are meant to be an integral part of the community and as such, in order for school effectiveness to be maximized, general goals and visions present in the school should be shared by the community. The need exists for shared visions about educational fundamentals, as well as the need for open and effective two-way communication. Several individuals identified communication between community and school as an area needing attention.

In several instances it was stated that unless an issue or crisis arose, very few members of the community had much awareness of the changes that were being attempted in the school. "Not unless it is an issue in curriculum that has to do with something. For example, I doubt very few people or members even

know what goes on in our science courses. They have never been to an inservice. They have never been in a classroom. They have very little idea as to what we are supposed to do in science." Agnes described "a whole new philosophy for a lot of parents with kids whose kids are coming and who have gone through the old system."

Discussions with Lennard, principal at Dennis Gorman School got into the area of parental views of school. Lennard believes that many parents are often unaware of the changes that are taking place. "They are seeing school as they were taught. Because there have been so many changes lately they don't see the new school. I have to start informing those parents what is happening. They want to know why they don't get a spelling test every Friday now." Instructional methods, resources, and evaluation are several areas Lennard identifies as in need of a communications strategy.

In some cases the reason for lack of awareness about school seemed to be busy parents who for a variety of reasons were unable or unwilling to get involved. Other parents see teaching as the teacher's responsibility--a job that parents need not get involved in. In other cases parents seem to be going on with the assumption that school fundamentals have not changed much since they themselves were students. For other parents reasons run deeper and get into the realm of alienation from school as an institution.

Hal believes that parents in his community have an attitude coloured by their own experiences with schooling. "Historically the parents have not had a large role in the school." At Thunder Ravine Jordan believes that "they see it as a foreign place almost. They are almost scared of the school." At Electric Falls and Rocky Ravine a rift exists between school and community, despite efforts over a number of years to bridge it. The gap was most vigorously presented at Thunder Ravine. "No matter how many times we bang against the wall it

doesn't matter. This community is not involved. That is our job. The school is just not an institution that is part of the community." The teacher goes on to emphasize how essential close school-community relationships are. "I believe that the school is not an institution in itself. It has to be part of everything. But then you try to do that and it is banging your head against the wall."

Janine sees overcoming the chasm in her community as a ten year strategy. Jordan speaks about tackling this deep rooted problem by focusing on trying to change the way students view school--students who will become parents of students. "If you can show the kids a good time in school they are going to change their attitude toward school."

Schools are striving to communicate with parents in a variety of ways. Some strategies are meeting with more success than others. Lennard believes that schools need more help to inform parents and community members about the changes taking place in the schools. He speaks about the "pamphlets and stuff" that Saskatchewan Education has developed and distributed but believes that "there has to be another way to touch the public."

All three schools are trying to find ways to overcome the gap between school and community. At Electric Falls what it took was a decision to get teachers out of the school and into the community. The focus of home visits was not the parent-teacher relationship but getting to know each other as people. "By going into the home you kind of break that down a bit and they see the school as having people working in there who are people with whom they have a common linkage." In addition to visits to homes, a decrease of staff turnover has helped begin the process of bringing the school closer to the community.

The challenge of linking community and school, in the case of Dennis Gorman School, though significant, was not described with the same degree of

emphasis as in the other two communities. Alienation from school as an institution did not seem to be an issue at Dennis Gorman School, perhaps due to the cultural mix present in the community or perhaps due to a greater level of student movement. Almost all students at Thunder Ravine and Electric Falls are from families who have lived in the community for several generations. Some parents, grandparents, aunts, uncles, and perhaps some of the students themselves, view the school system as an institution foreign to their culture. Community members have memories of residential schools, schools dominated by religious denominations, or educators lacking in acceptance and understanding of local culture. These memories and recollections, often passed down within an oral tradition likely colour attitudes toward school. Compounding this situation is the fact that the staff in northern schools is largely non-aboriginal. This situation is particularly critical when local homes are places where Cree or Dene is the only language spoken.

The issue of school-community relationships needs to be addressed. Those schools which have embarked on strategies are meeting with some success but their efforts might be enhanced by stronger support by others involved such as government, school divisions, and teacher organizations. In addition, local communities could become more involved in decision-making.

Deeper alienation described by teachers goes back several generations and is not a problem which has an easy remedy. The changing of attitudes will take time, and as several teachers indicated, the most effective solution is to ensure that the experiences of today's students are positive. Today's students will be tomorrow's parents and grandparents.

Shared Visions: Students

In some northern classrooms socioeconomic factors are affecting the implementation of the science curriculum. One teacher described the home reality of some of his students. "If you look at a hierarchy of needs. If you are struggling with meeting your more basic needs you aren't reaching out and wondering about why leaves are green or why that bug is doing this thing. You are worried about the next meal or staying warm, or a drink--something." As teachers put it on several occasions, "things are different here."

The most effective programs taught by the best intentioned and best-prepared teachers, carried out in well equipped schools, supported by the most effective communications strategy will not achieve expected levels of success if underlying socioeconomic problems remain. The incidence of problems such as poverty, illiteracy, alcoholism, drug abuse, child abuse, violence and unemployment are very high in all three communities studied.

Teachers implementing the science curriculum are doing so within a community context. Unfortunately this context includes many problems not conducive to learning. Teachers are grappling with the fact that the school is in many ways a reflection of the community. Because of this teachers feel the effects of problems being dealt with by members of the community. The situation described by Hal illustrates the importance of an integrated approach to solving community problems--an approach recognizing the school as reflecting the problems, as well as providing one of several avenues of prevention and treatment.

Shared Visions: School Division Personnel

In order to effectively implement a complex change all those involved in the enterprise should share accurate visions of what is to be achieved. In Northern Lights School Division the role of overseeing the supervision and evaluation of teachers and school programs is usually assigned to a Superintendent of Education. Several teachers expressed concerns about the level of new program understanding possessed by supervisory personnel such as Superintendents of Education. It was not within the scope of this study to determine whether such teacher perceptions were accurate. However, such sentiments arose from sporadic attendance of supervisory personnel at implementation inservice, as well as from a lack of focus by superintendents on the science curriculum during their periodic visits to the school.

Teachers were facing curriculum change and finding it a challenge to practices and beliefs pertaining to teaching and learning. Teachers expressed the view that while beginning the process of implementing the elementary level science curriculum they were taking risks. What many of them wanted from their supervisory personnel was reassurance and assistance arising from an understanding of the changes they were dealing with. Several teachers expressed uncertainty as to whether their view of where they were to go and how they were to get there was shared by their Superintendent of Education.

Teachers indicated that they understood that they were to implement the elementary science curriculum and that this could take from three to five years. However, teachers were unclear as to detailed expectations regarding implementation and did not notice much attention being paid to the issue. One teacher stated that "Until you came nobody has asked in a formal way what is going on." Another teacher stated that "There isn't anybody as such checking that out to see if we are on task here and so forth." Teachers interviewed indicated

that few people in the educational enterprise other than they themselves seem to be aware of where each teacher is at in terms of grappling with implementation of the elementary science curriculum, despite the fact that the curriculum implies changes in materials and their usage, instructional practices, and beliefs.

The question of what role school division supervisory personnel, as well as principals, should play in supporting change is a critical one that needs to be answered. Recent literature on leadership contends that the time has come for a new conception of leadership. Traditional leadership functions described as "bossing" or "managing" need to give way to a more contemporary "leading" function. Patterson (1993) describes such "leading" as being "the process of influencing others to achieve mutually agreed upon purposes for the organization" (p. 3). Patterson sees a need for openness to participation and conflict, a recognition of the importance of reflection, and a need to value "employees acknowledging mistakes and learning from them" (p. 12). This view of leadership meshes well with other authors such as Fullan who identify the need for schools and school systems to become learning organizations--willing and able to deal with change on an ongoing basis. The schools and the school division involved in this study might benefit from an analysis of contemporary views of change and leadership, with the aim of incorporating key elements of such views into their organization and its practices.

Summary

Fullan (1993) writes about the importance of vision but suggests that "ready, fire, aim" (p. 31) is a more fruitful sequence for an organization undergoing major reform. He cautions against premature vision, mission, and strategic planning. It is only after initial actions to implement the innovation when skills, clarity and learning occur. Aims come last--viewing mission and

vision statements and focussing strategic planning as outgrowths of shared experiences working toward a general aim. My research indicates that most teachers have a general sense of where elementary science curriculum implementation is going. They are "ready". However, few have ventured very far into the "fire" stage, with most teachers still struggling with elements of the innovation. Formal vision and mission statements and a clearly articulated and solidly supported sense of direction and purpose--"aim"-- have yet to develop.

An initial analysis of the data might lead one to conclude that all is not well in terms of vision. However, if one supports Fullan's "ready, fire, aim" notion, what teachers are expressing and experiencing is to be expected. Only after working through the curriculum and its implications will they be able to actualize what now for many is only a general sense of direction and appropriate practices. Deeper understanding and implementation will occur as the process of interaction with the curriculum takes place. The critical factor is to ensure that such interaction takes place.

Skills

Major educational innovations such as implementation of the elementary science curriculum involve potential changes in materials and their usage, instructional practices, and beliefs. These three components usually involve the need to acquire new skills. The science curriculum advocates an approach to teaching and learning that is student-centered, activity based, and inquiry oriented. The curriculum also advocates a resource-based rather than a textbook centered approach to learning.

A move to such a science program impacts on teachers to varying degrees. At one end of the spectrum are those teachers for whom the new curriculum validates what they have been doing for years. At the other end of the spectrum the new curriculum advocates an approach alien to present practices and beliefs. Most of the teachers fall somewhere in between these two extremes.

Instructional Change

One principal indicated that a major challenge facing teachers attempting to implement the new science curriculum was the move toward varied instructional approaches. "There are some teachers in our school who have the lecture method as a backup, but some of them use it far too frequently." Most teachers indicated that learning new strategies, methods and skills associated with instruction was one of the major challenges associated with implementing the curriculum. Associated issues such as planning for instruction, and developing assessment and reporting methods, were also mentioned. Teachers interviewed confirmed Guskey's view that "Teachers carry with them to staff development programs a very pragmatic orientation." (Guskey, 1986, p. 6).

It is ironic that much of the current literature on educational change states or implies that teachers need to be change agents. However, the reality as described by many teachers in my study makes this very difficult. To be a change agent teachers need to make contact with new ideas and processes. However, teaching load "confines them to the classroom, which greatly restricts access to new ideas and innovations" (House, 1974, p. 69). In many cases the average classroom and its teacher is "an island unto itself, rarely intruded upon by a school administrator for evaluative or improvement purposes" (Smith & Andrews, 1989, p. 3). It is perhaps understandable that to many teachers educational changes seem to come in waves or surges, with some teachers viewing it more as a tsunami wave rather than a gentle swell on a navigable sea.

Many teachers spoke about the need for networking opportunities or the need for time to sit down and do some planning. Others made evident deeper challenges beyond what can be addressed by a few inservice days. For these teachers other more intensive measures are required, such as attendance at a summer school session or a specific class targetted at an area of need. A major part of the challenge is to identify which teachers need what kind of assistance. The implication of this is the need for the school division and school personnel to effectively work with teachers to identify areas of need and to cooperatively develop plans to address such needs.

Just as some teachers find the approaches advocated in the curriculum to be new and challenging, so do some students, particularly if it is the teacher's first steps into a new instructional method. "Some teachers who are more traditional, the first time they take a risk they have a lot of problems with the students reacting to it because all of a sudden the students may think that it's free time." Several teachers indicated that efforts need to be made to ensure that students are aware of the changes taking place and that strategies to implement such changes

take into account how innovations impact on students. Students need to be involved in the process and teacher expectations of both themselves and their students need to be realistic.

"Student expectations are a neglected yet crucial aspect in relation to the success of some innovations" (Fullan, 1991a, p. 183). My findings indicate that part of the challenge teachers are facing is the fact that the new science program involves changes for students. Most teachers are concerned with how the innovations are impacting on their own practices and spoke little about the role of the students, perhaps a natural situation according to Hall and Loucks (1977). How students deal with changes in the classroom is perhaps just as critical as how teachers deal with them.

Interactive Opportunities

Most forms of inservice training are not designed to provide the ongoing, interactive, cumulative learning necessary to develop new skills and beliefs. Failure to realize that there is a need for inservice work during implementation is a common problem. Inservice is critical, in the form of sustained interaction and staff development (Fullan, 1991a). In addition to introductory inservice, there is a need for ongoing support. "Training without subsequent follow-up leads participants down dead-end paths" (Killion & Kaylor, 1991, p. 64).

Inservice initiated by the Department of Education, Training and Employment was identified as supportive to teachers in their efforts to implement the science program. However, teachers described provincial inservice as an introduction, with much more ongoing support needed. Such support is considered by the Department of Education, Training and Employment to be largely a school division responsibility. One teacher at Dennis Gorman School

stated that inservice "has helped me. But a day is not enough. We need a lot more. It sort of just gets you into it." Lennard believes that if teachers are left alone without support or inservice "they will continue with their tried and true methods that involve standing up and saying we'll do from this page to this page." Teachers also need time to "go back and touch, to reflect, to rethink, to see things again."

Wenz and Adams (1991) outline a variety of reasons why follow-up staff development efforts often do not take place. Follow-up can be expensive, particularly if a complex initiative requires long-term, multi-faceted staff development support as in the initiative studied here. Follow-up can also be disruptive to traditional practices and beliefs, as well as to existing interpersonal patterns in the school. Follow-up is also time-consuming--an acute problem in the schools studied since teachers have a limited number of inservice days available within the context of the regular school year. All three of these factors seem to be at work to varying degrees in the three schools studied.

School division measures aimed at providing interactive opportunities are appreciated by teachers and seem to be enhancing implementation efforts. However, not all teachers are availing themselves of networking opportunities and such measures are not promoted to the same degree in all schools. Liane stated that at Electric Falls the opportunities just do not exist for much networking beyond the school. Teachers need to be made aware of and be encouraged to take advantage of networking opportunities which exist. In situations where networking has not been available, such measures should be encouraged.

Inservice takes place within the context of limited inservice day availability and concern about public perception. Ron's school received feedback from the community regarding their inservice. "Gee these teachers! Don't you ever teach? You are always at an in-service." Although teachers would like, and seem to need, more days for inservice and professional development, too many days, or days grouped too closely together, can lead to community concerns. Evidence indicates that if the professional development needs of teachers are to be met they will have to be met through a greater degree of staff development on the teacher's own time, or they will have to be addressed through novel approaches to the organization of the school year. Both of these suggestions have implications but may have to be considered if what teachers need and want is to be achieved.

Teacher Training

The importance of teacher education was raised as critical to the long-term success of science implementation. With Saskatchewan Education, Training and Employment regional inservice available only during the initial implementation year, and given the introduction of new courses every year, it is critical that training prepare teachers to deal with new programs. There is too much happening too quickly for teachers to play catch-up in more than one area at a time. Agnes states that "a new teacher wouldn't have a foggy hope unless they were familiar with the curriculum guide, to come in." Teachers saw it as impractical to expect teachers to gain familiarity with more than one curriculum at a time within the context of a regular school year with regular teacher duties. Teachers have to be well prepared to teach new programmes when they leave teacher education institutions and move into teaching positions.

Several teachers gave high marks to teacher education institutions, particularly those which concentrated on teaching methodology and new

curricula. As a principal at one school stated, "new teachers who are coming right out of university right now or the last five years are different. A whole different kettle of fish than teachers who have been in the system for ten or fifteen years. Totally different." Teachers who have been in the profession for ten or fifteen years expressed the belief that they were ill-prepared to deal with the changes expected of them by the provincial government and their school division. When it came to preparation to teach science, teachers made reference to "only that basic training" or, in some cases, no science teaching methodology at all. Many teachers do not believe that they possess the skills required to teach science as outlined in the curriculum. Many are struggling to acquire such skills but see the task as one of major proportions. This situation needs to be addressed in some way.

If curriculum implementation is to be successful, instructional leadership in the school needs to extend beyond the principal to the teaching staff. One teacher indicated that the instructional leader in the school "doesn't necessarily have to be the administrator." Fullan (1993) sees a need for all teachers to be instructional leaders--"extending leadership beyond the principal" (p. 127). If teaching is to become a learning profession, most teachers will need to become "change agents capable of working on their own sense of purpose, through inquiry, competence building, and collaboration" (p. 127). My data indicates that few teachers, and also few principals, are equipped, or able to assume the kind of instructional leadership necessary to bring about major changes needed to implement curricula such as elementary science.

Principals as Instructional Leaders

Potentially one of the greatest resources to support science implementation is the knowledgeable, ongoing involvement of an instructional leader in the

school or school system. Ron, principal at Electric Falls, indicated that just as there are many things on a teacher's plate there are also many things on a principal's plate, making it difficult for principals to play the role both they and the school division would like to see. Ron indicated that in some ways it was outside his control. "Well you define it and it gets defined for you basically. The things that if they don't get done on time that get the most attention from central office are the ones you want to make sure you get done on time."

The actions of principals in this study are closely in line with other research indicating that conditions shape leadership behavior. These studies suggest that "the principal's leadership behavior is shaped by the perceptions of how other people want the leader to behave. The principal's perception of role requirements is influenced by prescriptions such as job description, day-to-day requests, and orders and directions from the superintendent" (Smith & Andrews, 1989, p. 5). In the absence of a clear set of expectations regarding roles in relation to supporting curriculum change, such prescriptions take on an even more pronounced role in determining the actions of principals.

Ron and other principals expressed a clear view of what role principals should play but expressed frustration at their inability to perform that role. Ron believes that he "didn't spend enough time in the classrooms." Another principal described the situation as "you have your classroom and I have my classroom." One teacher described her principal as "really behind us in everything that we implement", but that main actions have been in the area of "buying equipment and things like that."

All three principals and the vice-principal interviewed are in the middle of a very complicated change process which, by their own admission, they have had little time or specific training to deal with. According to researchers this scenario is common--the person charged with the responsibility for bringing about

change knowing little about the nature, processes and roles inherent in change of any kind (Fullan, 1991a). Individuals who manage educational innovations generally "attempt to carry out their responsibilities and cope with their managerial tasks as best they can, leaning heavily on intuition, previous work experience, and common sense" (Gross, 1979, p. 20).

To be involved as an instructional leader or change facilitator means that principals will need to depart from traditional roles and activities. To do so means making hard decisions about what to focus on, what to delegate, and what to say no to. Making hard decisions such as this without clear expectations from central office puts principals into a very vulnerable and awkward position. Clarifying the expected role of principals as facilitators of change, helping to ensure that they have the requisite skills and aptitudes, and empowering them to make the adjustments needed to perform such roles, could assist in the implementation of the science curriculum, and perhaps other programs.

Although this paper focuses on elementary science teaching and learning, many concerns associated with skills intersect with other curricula in other areas of study. The move toward student centered classrooms, the need to be adept at a variety of instructional approaches and assessment techniques, as well as expectations regarding adaptation for learners and instructional leadership roles, are aspects of teaching and learning common to all new curricula being introduced into northern schools. Few teachers or principals indicate that they have all the requisite skills and few seem to see the present opportunities to gain those skills as sufficient.

Though beyond the scope of this study, indications are that for some educators problems with the implementation of science run deeper than the question of time. "The problem of change cannot be addressed unless we treat continuous teacher education--pre-service and inservice--as the major means of

producing teachers as change agents" (Fullan, 1993, p. 7). Some teachers indicate the need for major professional development opportunities far beyond what school divisions or the Department of Education, Training and Employment are able to provide.

Summary

Several reasons often exist to explain why educational reform is so difficult. One such reason is undoubtedly the fact that challenges are so complex. Another reason is that "strategies that are used do not focus on things that will really make a difference. They fail to address fundamental instructional reform and associated development of new collaborative cultures among educators" (Fullan, 1993, p. 46). One must keep in mind that a purely "innovation-focused approach is too narrow and too weak an intervention to impact on more basic institutional conditions that must be altered if teacher development is to fluorish" (p. 4). If the science curriculum is to be implemented effectively, underlying instructional and organizational challenges will need to be addressed. New collaborative methods of identifying and addressing challenges to implementation are needed.

If teacher development is to be addressed effectively it should be "innovation-related, continuous during the course of implementation, and involve a variety of formal (eg. workshops) and informal (eg. teacher-exchange) components" (Fullan & Hargreaves, 1992, p. 2). Measures to address teacher development also need to recognize that "age, stage of career, life experiences, and gender factors--things that make up the total person" (Fullan & Hargreaves, p. 5) can be important factors.

It is also helpful to recognize that few schools possess the kinds of exceptional administrators and teachers referred to or hoped for in much of the

literature on implementing educational change. "There are exceptional and appalling schools and school administrators, to be sure. But most are garden-variety ones--with weaknesses and strengths, with a few virtuosi and many more humdrum staff, along with some fairly problematic people" (Fullan, 1992c, p. 18). This statement is harsh but does point out the need for approaches which recognize the diversity of school and school system realities.

Incentives

In examining the issue of incentives for implementing the elementary science curriculum one is immediately struck by the preponderance of instrinsic rewards and the paucity of extrinsic rewards. House (1974) describes teacher experiences as an "economy of scarcity" (p. 74). There are few opportunities for professional advancement. Tenure and salaries are tied to years of service and degrees granted. "Ambitious teachers are forced to leave the classroom or education itself to advance professionally. One of the few tangible rewards for working on an innovative project is the increased chance of promotion" (p. 73).

Educators indicated that a variety of factors, readily grouped as incentives, were assisting or hindering them in their efforts to implement the elementary science curriculum. These factors will be explored in the following paragraphs.

Curriculum Characteristics

Activity-based science teaching has been an incentive to implementation for those teachers who have tried it. Hal states that "It's actually fun. I have more fun with the grade four class. They are, through research, through observation, through attempting to try things out, they are coming up with the facts. They are coming up with the concepts, and so the concepts are real and have relevance."

Teachers indicated that in some ways the science curriculum was effective with students for whom English is a second language. "Because they are doing and they are seeing. What they are talking about is what they are doing and you can tell them a term and it has some meaning to them." Varied reading levels of students created challenges for Liane. "The grade two class I had this year were

non-readers." These varied levels made it necessary to incorporate science concepts into thematic units and made hands-on a necessity.

Sometimes the curriculum was not very appropriate to northern experiences and had to be adapted. Janine described a harvest theme. "Well harvest. You can't do that up here. They don't have a clue what you are talking about. Harvesting up here might, you could take it in a different sense." Jack's substitution of wild rice for wheat is another example, as is Violet's decision to deal with northern animals such as caribou, rabbits, muskrats and birds rather than farm animals. "I don't think they have ever been to a farm or ever touched a horse or a cow or seen chickens." According to Janine "They have great ideas in there but you can't always do them here. You have to adapt them to where you are." Despite this need to adapt, teachers were generally pleased with the curriculum, finding within it a framework within which they could work.

Agnes found the curriculum to be very adaptable. "We used a lot of northern animals that they were familiar with. If we are talking about science it adds a lot to it because they have a lot of background knowledge being that they live close to nature and are interested in it and have parents usually who are interested in the fish or whatever."

Many teachers used the curriculum guide as a means of gaining a general sense of direction rather than as a detailed, specific teaching resource--a departure from what developers had intended. It should be no surprise that all teachers liked the curriculum, since teachers are using the parts they like and giving only cursory attention to the parts they do not like or do not see as useful or worth the effort of growing familiar with. Rather than saying that teachers generally liked the curriculum, one might better capture the spirit of the situation by saying that teachers liked the freedom to use the curriculum as they saw fit.

Meeting Needs

Teachers indicate that implementing the elementary science curriculum means dealing with change on a personal level. If teachers are to put forth the effort necessary to make change happen it is important that they see the changes as necessary. How one approaches an innovation is influenced by whether or not you see it as needed or timely. Many innovations are attempted without reflection on whether or not they deal with what are seen as priority needs (Fullan, 1991).

Teachers interviewed expressed the belief that there was a need to rejuvenate elementary science teaching and learning and saw in the new curriculum an articulation of what they perceived as "good" science. The implementation of a new, more contemporary science curriculum was seen as a needed reform, both in terms of the larger provincial, national and international scene, as well as in terms of addressing a need for northerners to acquire a stronger science background in order to improve their employability in northern science-related jobs and careers. No teachers spoke in glowing terms about existing science teaching or longed for the good old days.

Those teachers who indicated familiarity with the curriculum spoke about practical concerns and saw the document as meeting their needs. "They give you the information. They lay things out--your objectives, your skills you want them to learn. It gives you everything there for you as well as it provides you with some content." Teachers believe that the curriculum documents are of high quality and workable in northern schools. The fact that the science curriculum was adaptable and that northern teachers had contributed to its development were seen as positive factors. Those who used the curriculum and indicated familiarity with it found some good ideas as well as a philosophical framework.

Despite general agreement that changes were needed in science education, and despite both a governmental and school division focus on science implementation, the reform of science programming was not always the primary curriculum reform focus of teachers interviewed. In all three schools the most pressing need was seen to be English Language Arts. In one case this was partly due to the presence of several English Language Arts pilot teachers on staff. In the other two schools addressing the needs of students for whom English was a second language was seen as more important.

In Janine's school the perceived high need area was not science. "Actually we picked Language Arts and Language Arts is not even coming in yet. But we are kind of going in reverse which is terrible but the needs of these kids are Language Arts so we have pushed Language Arts this year." Teachers described situations in which schools seemed to have the freedom to decide between local, school division and provincial initiatives in terms of implementation focus.

Part of the explanation for school freedom of choice is undoubtedly the fact that physical isolation and a general history of adaptation to meet local needs exists in the north. However, as several teachers indicated, little attention was paid to the details of science curriculum implementation by either principals or school division supervisory personnel. Principals and teachers alike spoke about a multitude of duties and teaching loads which made it difficult for school administrators to play an active role in supporting curriculum implementation. Irregular visits, administrative concerns, or the need to focus on new teachers or crises were advanced as reasons why school division supervisory personnel did not emphasize science curriculum implementation. This lack of visible, emphatic focus on implementation may have contributed to school treatment of science curriculum implementation as but one of a variety of things to choose between, rather than as a major curriculum thrust to be treated as a high priority agenda item.

School Division Incentives: Support and Pressure

The involvement of central administrators is critical in order for change in school division practices to take place (Fullan, 1982, p. 65). Some teachers have a tough time taking change seriously unless administrative support is strong and visible. As to why it is important to monitor implementation, one teacher had some views. "Saskatchewan Education has to put out, central office or someone has to put out, or like superintendents or something have to put out well what are you doing with this one? There has to be some form of accountability." "Teachers and others know enough now, if they didn't twenty years ago, not to take change seriously unless central administrators demonstrate through actions that they should" (Fullan, 1991a, p. 74). Though teachers made reference to distance and the cost of travel as a deterrent to regular, lengthy classroom visits, most expected the school division to carry the major role of monitoring implementation and believed that it had not taken place.

Teachers expressed general satisfaction with the funding levels and with certain school division programs such as science fairs. However, intangible incentives, such as school division supervisory personnel taking an active interest in implementation and working together with school personnel to develop plans to nurture change were noted as both important and lacking.

School Incentives: Support and Pressure

Actions of the principal indicate whether an innovation is to be taken seriously and provide incentives for change through both support and pressure. "One of the best indicators of active involvement is whether the principal attends workshop training sessions" (Fullan, 1991a, p. 76). Maureen expands upon what attendance at inservice should be. Principals should "attend them attentively, not

dash out and answer a phone call that comes along."

Ron identified the support role of principal as critical in instructional change. "My job is saying that yes, be a risk-taker, and if things really screw up just keep me informed on how they screwed up." Kerry believes that not all teachers accept change enthusiastically and that an effective school principal also needs to get into classrooms and exert some pressure for change. "By coming in there the pressure is put on that teacher to live up to the expectations of the curriculum."

All administrators interviewed supported the notion, well supported by research, that a principal can and needs to play an active role in providing both pressure and support for curriculum implementation. However, both teachers and school administrators indicated that limited opportunities have existed for principals to play such a role. A clearer definition of the role of the principal in providing pressure and support for change, and a delineation of duties to make such actions feasible, could contribute to science curriculum implementation.

Staff Continuity

Frequent teacher turnover can be a factor decreasing incentive to change. In the case of the three schools involved in this study, a lack of staff change from year to year was a factor operating in favour of curriculum implementation. "This is our third year that we have all stayed. If you had come three years ago and asked us the same questions you would have gotten completely different answers because this is the first time that they have had such consistency. Teacher turnover is a huge factor up here."

Thunder Ravine School has initiated a resource sharing plan which is in

large part dependent on staff continuity for its success. Electric Falls is initiating a home visitation initiative to bring parents and teachers together--an initiative which will pay dividends over the long term. Both schools report early successes with these measures. Since the time of research, however, both Thunder Ravine and Electric Falls have experienced major staffing changes. It would be interesting to see what effect this has had on implementation efforts.

Summary

Several incentives are present, as well as lacking, to help teachers and schools implement the elementary science curriculum. One incentive acting to support implementation is the curriculum itself. Teachers who have worked with the curriculum find it effective and rewarding. One of the greatest incentives for teachers is the realization that northern students and teachers enjoy science taught in the manner advocated in the curriculum. Learning takes place and it is fun. However, an incentive pointed out as distinctly lacking in many instances was instructional leadership. Few teachers described situations where either school or school division administrative personnel were exercising sustained and strategic support and pressure to bring about change.

People are often shocked to think that teachers would even contemplate tangible incentives to try a new innovation. However, those same people also are often unaware of or forget about the personal costs of trying new innovations. Seldom is there any indication that innovations are worth the investment. "Innovations are acts of faith. They require that one believe that they will ultimately bear fruit and be worth the personal investment, often without the hope of an immediate return" (House, 1974, p. 73). Few tangible or concrete incentives were cited by teachers--a type of incentive which could perhaps be considered to enhance implementation of the elementary science curriculum.

Resources

In this section I discuss various resources contributing to or hindering implementation efforts. Many things, such as the presence of instructional leadership, could be considered as resources. However, I choose to focus on concrete factors such as space, time, and support materials.

Class Size

The elementary science curriculum provides a blueprint for science teaching and learning which is student-centred and activity-based. Students need to be involved in science learning by touching and manipulating--by interacting with science and experiencing it first-hand. As several teachers told me, such science teaching and learning takes room and entails a different role for teachers than traditional teaching and learning. Learning in a cooperative setting places teachers in a position where they need to have a sense of both the content of what is going on, as well as a grasp of the processes taking place.

Hal described his efforts to facilitate cooperative learning in science as "tough" when he had "up to 35 or 36 students at the high point." The result of this was a teaching situation which was "absolutely ridiculous. Teaching science or teaching anything was merely a sideline." Kerry described a situation which was similar--a situation where working with groups was nearly impossible. In both Hal and Kerry's classrooms, class size was a variable hindering implementation.

Several teachers related stories of rising enrolments leading to the loss of science rooms--rooms which were needed as regular classrooms. Liane believes that "we did a lot more hands-on activities because of the fact that we did have

this room and we knew where to find the materials."

It is important that the context for learning be considered. For several teachers interviewed the major factor hindering their efforts at implementation were organizational. For those teachers dealing with 35 or more students in a classroom meant for half that number, and in rooms designed for traditional instruction, bringing their visions and that of the curriculum to life seemed an almost unachievable goal.

Time

Teachers regularly echoed research indicating that "teachers involved in change efforts need time to plan, revise curriculum, discuss their problems, try out new techniques, and rethink their instructional practices" (Herriott & Gross, 1979, p. 247). In one of the schools the issue of the altered school year was raised. According to this plan school days are lengthened slightly to make it possible for school to close early in June. This altering of the school year is permitted by the Education Act with special permission based on special needs and is in effect in Thunder Ravine. In many communities in northern Saskatchewan early June marks the move of families from settlements out to summer homes on rivers or nearby lakes. Attendance in many schools drops drastically at this time of year. Altering the school year is an adjustment to address attendance realities.

The altered school year, while taking into account attendance patterns, creates challenges for teachers related to the implementation of new curricula. Janine explains two such related challenges: inservice days and seasons. In terms of inservice days a shortened school year makes each inservice day a larger portion of the overall instructional allotment. This makes it tough to get through courses, but also makes a missed instructional day more visible to community

members who see teachers and students out of the classroom for three months in the summer, and other times during the year.

Early dismissals, an approach commonly used to avoid school shut-downs for a full day, are also complicated by the altered school year. When the day is longer to start with, adding on to it makes for a very long day for teachers and sometimes results in sessions that are not particularly productive. Teachers at Thunder Ravine, as well as in the other two communities involved in this study, require inservice in order to implement new curricula. However, as the demand for inservice days within the context of the school year, regular or altered, mounts, new approaches to meet these needs will have to be found.

The altered school year also presents instructional challenges for teachers. Teachers at Thunder Ravine find that at the very time of year when outdoor activities advocated in curriculum guides and resource books are most appropriate and enjoyable, school closes. "The pond exploration and water exploration. It is fantastic up here. You have the rapids, you have the fast running water, you have the swamps, you have the muskeg, but to utilize those resources is difficult because the school year ends in June. As well as in the fall, having only a month in the fall before everything is gone again." The experiences of northern teachers and schools have had with an altered school year can provide data for other schools and systems considering school year options.

The altered school year is not widespread, even in northern Saskatchewan. However, for those schools which do operate with an altered school year, the emphasis in curriculum guides on what some teachers describe as "bugs and ponds" is something teachers have to deal with. A greater emphasis on cold weather activities or issues would be a welcome addition to curricula for teachers operating with an altered school year, as well as for other schools for whome summer is long in coming and short lived. As pressures increase in

Saskatchewan for options to the existing school year format, some of the concerns expressed by teachers in this study may be voiced by teachers elsewhere.

Resource Procurement and Organization

Resource procurement and organization is an issue in northern communities. Teachers related stories of how hard it was to get certain required materials in the North. Darlene described a quest to find shoe boxes while Janine described trying to do an experiment and finding out that she needed light bulbs and a battery and it "costs a fortune to fly it in." Jordan described frustration at being unable to find limewater tablets. According to Jordan, being unable to obtain these science resources "is a major, major thing."

Once schools obtain resources organizational problems arise. People get all their materials ready and then they go in the next year and there are no resources or they are not where they should be. Teachers expressed the belief that if resource-based, hands-on science is to take place resources need to be readily available. In both Thunder Ravine and Electric Falls the situation was described as "a total disaster."

Some schools are recognizing the importance of resources and are developing strategies to maximize their effectiveness. Schools in the far north, including Thunder Ravine, have taken a northern inventory of resources and have utilized a networking day to coordinate instruction so that key, more expensive resources can be shared between the schools. Reports are that their initiative has been successful. However, success is largely dependent upon staff continuity and a commitment to utilizing limited networking time. Since the time of research staffing has changed in the far north and if the resource coordination efforts are to continue, the process will have to be revisited.

Several teachers saw a need to identify an individual as a resource coordinator, and if it happens that that person moves from the school, that the identification of a replacement coordinator be made a high priority. Teachers described the role of resource coordinator as one commonly viewed as a minor task taken on by a volunteer. From the description of the needs provided by teachers, the job of coordinating the purchase, organization and tracking of school science resources needs to be ranked right up there with coaching the volleyball team or organizing for graduation. Perhaps if this were to happen, this challenge to implementation could be addressed.

Summary

Teachers were generally pleased with the level of resource support provided for science implementation. Funding levels were seen as sufficient to purchase materials deemed necessary. Any problems associated with resources were more related to organization and coordination. Several teachers were faced with an overabundance of one critical resource--students--resulting in situations where the implementation of the curriculum as intended was virtually impossible. Teachers also voiced concerns about the lack of that most valuable of commodities--time.

Action Plans

Few travellers embark on a voyage without involvement in drawing up travel plans, without a shared sense of direction, without knowledge of what mode of transportation will be used, how much the voyage will cost, the general route to be followed, and the means to deal with inevitable problems and changes in plans along the way. Implementing a complex change such as the elementary science curriculum is very similar to such a voyage.

Educators in my study made reference to most of these items. They spoke about timelines for implementation, varying levels of commitment to the implementation voyage, special travel needs, past experiences, concern about the committment and support of their travel agents and tour hosts, and some concern about whether those sending them on the voyage were concerned about how they were doing. The following paragraphs deal with these various components of the implementation voyage--referred to as Action Plans.

Timelines for Implementation

Time perspective is one of the most commonly neglected aspects of implementation action plans (Fullan, 1982). According to teachers interviewed, timelines for implementation vary, depending upon a variety of factors and situations. Kerry, an exception to the rule, felt that she made considerable gains in the first year. "I would rate myself low at around a five out of ten when I was in grade three up until Christmas. But then from Christmas on I really grew." Most teachers, however, described a multi-year process.

Hal provides his view of timelines for the implementation of science. "It is basically a three year effort. The first year is a real struggle. You just salvage

what you can out of it and try to tie these alien parts together to make something. The second year is a building on what you did the first time so it is going to be better. In the third year you feel like you are actually doing something successful. In the fourth year you get better at it." It is important that those making decisions regarding timeline expectations listen to people such as Hal. Often decision-makers are inclined to take an adoption, rather than an implementation time perspective and strive to bring forth much more than practitioners can integrate. "Central decision-makers know the complexities of the adoption process" (Fullan, 1982, p. 68). They know what is necessary to gain approval for, and to launch the initiative. "Practitioners know the complexities of the implementation process" (p. 68). When a subsequent curriculum is introduced, it is important that all those involved in the implementation effort realize that most teachers are just beginning a complex multi-year implementation process.

Implementation can be described as "a dynamic construct, which refers to the process of continuous specification and redefinition of the essential characteristics of an innovation by developers and users during the planning and implementation phases of the planned change process" (Fullan & Pomfret, 1975, p. 71). This statement is in direct contrast with sentiments expressed by educators interviewed. There has been a tendency to view the science curriculum as an event that needs to happen rather than as a time-consuming, complex process touching upon almost every aspect of the educational enterprise. The pressures of other initiatives, the existence of an implementation schedule, and minimal attention to curriculum maintenance has contributed to a vision of curriculum implementation that is chronological and sequential.

Timelines for implementation are not the same for all teachers and can vary depending upon the teacher's exposure to curriculum change. The principal in one school noted a marked difference between teachers who had been involved in innovations and those who had not. Teachers who had been exposed to earlier

innovations seemed to respond to curriculum change more willingly and had an easier time with it. "I think you will find that the teachers who are piloting projects move through it a lot quicker." The ripple effect works its way through the staff. Teachers closely associated with pilot teachers seem to take two to three years, whereas others are only partly there after three years and may take four or five.

Most teachers spoke about the need for longer implementation timelines but Maureen cautioned against erring in the other direction. "The faster the better. If you let people doddle along and choose well maybe we'll implement that next year, some places will never do it. That is not fair to the kids."

Curriculum Maintenance

Curriculum maintenance refers to many areas which warrant attention as implementation proceeds. Some of these concerns, such as resources or networking opportunities can usually be predicted and planned for. Many others, such as the need to enhance specific instructional skills, are often school or teacher specific and may only become apparent while implementation is underway.

Teachers spoke very positively about school division initiatives aimed at assisting with curriculum implementation. The school division involved in this study put in place a steering committee for science. They also put in place plans to allow for the networking of teachers and administrators. Consultants were employed to provide assistance. School administrative personnel were inserviced regarding curriculum maintenance components and an inservice package was developed by regional office to be used by schools as a framework for local activities. The school division targeted funding for resources to support

implementation and received additional funding for special projects such as science fairs.

Examples of successful implementation tell us that there is a need for "continuous interaction with peers and consultants during the process of implementation" (Fullan & Pomfret, 1975, p. 44). According to Sparks (1992) one of the reasons many changes fail is because there is insufficient interaction during implementation. "People experience the process individually without the social/psychological support that's necessary for success" (p. 7).

According to Fullan (1993) isolation imposes a ceiling on inquiry and learning. "Solutions are limited to the experience of the individual. For complex change you need many people working insightfully on the solution and committing themselves to concentrated action together" (p. 34). Teachers indicated that opportunities to work together were very profitable and appreciated. Janine, as well as other teachers, identified funding for networking opportunities as very helpful, but expressed the need for more such opportunities.

The monitoring of implementation is something which several teachers identified as an area needing more attention. A teacher at Electric Falls indicated that "There has really been no follow-up that I know of. Until you came nobody has asked me in a formal way what is going on." Hal sees implementation monitoring as a shared responsibility. "In the chain of process it goes from Saskatchewan Education to the division and then the division should be responsible for implementing these changes. It also drops down to the school level. If they are going to initiate new programs then I think that it is important that they also monitor how those programs are going."

Monitoring is essential if educational change is to proceed. Monitoring mechanisms "locate the stresses, strains, and frustrations that accompany most

change efforts" (Herriott & Gross, 1979, p. 28). If such impediments to implementation are not identified and eliminated "they can readily snowball and result in the rapid abandonment of the innovation" (p. 28). Teachers believed that such monitoring had been largely absent and that no one had picked up this responsibility. Leithwood (1981) suggests the use of an innovation profile to develop a staged description of curricular innovations. In a basic form this would consist of "steps or stages associated with different levels of use of a program on one axis and dimensions or components of the program on the other axis" (p. 26). Models such as this could assist in determining levels of implementation and in developing strategies to meet specific needs.

Teachers who spoke in any detail about the role of the Superintendent as it applied to curriculum implementation monitoring indicated that the level of focus was minimal. "Whenever I think of the science curriculum and fine arts having to be implemented I think of central office. I don't think it is coming through him. He plays a different role." Research indicated that neither central office or government personnel have been actively involved in the monitoring of science curriculum implementation.

Central office, through the tasks assigned and through the expectations communicated to schools, determines what to emphasize. The fact that school division central office personnel did not seem to play an active role in monitoring curriculum implementation leads to the conclusion that primary responsibility for such monitoring must belong to the principal. Several principals indicated that being an instructional leader in efforts to implement science is but one of a variety of tasks, and as such is one that at times gets little attention. Teaching expectations made of principals, as well as placement of curriculum implementation amidst a wide array of other items for which the principal has responsibility, has had the effect of limiting the role that principals can play in monitoring, supporting, and nurturing curriculum implementation. My findings

parallel comments by Fullan that "All major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change, but it also indicates that most principals do not play instructional or change leadership roles" (Fullan, 1991a, p. 76).

When considering implementation monitoring, questions arise as to what type of information to gather. "There is no evidence that information on student achievement by itself results in improved implementation" (Fullan, 1982, p. 69). It is valuable to gather information from a variety of sources but "it is at the school and classroom level where information counts" (p. 70). At the time of data gathering teachers were into their third year of science implementation--a time when one might assume that data had been gathered on the implementation process and acted upon. By the third year one would also expect that some planning was underway to gather initial data on student learnings.

Interviews indicated that very little data of any sort on the implementation process has been gathered but that the Department of Education, Training and Employment had gathered some data on learning outcomes. Concerns voiced by Fullan & Pomfret (1977) seem strangely familiar. "There is a singular lack of curiosity about what happened to an innovation between the time it was designed and various people agreed to carry it out, and the time that the consequences became evident. Once an innovation was planned and adopted, interest tended to shift toward the monitoring of outcomes" (p. 337). We still seem to be operating from a black box paradigm whereby "innovations entering one side somehow produce the consequences emanating from the other" (p. 337).

There is a need to learn more about the individual and collective implementation realities of teachers and schools. It is obvious from my research that issues and concerns need to be addressed if implementation is to proceed successfully. It is also obvious that the Department of Education, Training and

Employment sees its major area of responsibility in the area of monitoring to be learning outcomes. What this leaves is a void in terms of the monitoring of implementation. If critical issues and concerns are to be addressed I conclude that someone will need to take responsibility for process monitoring. This would be a major task, which if carried out by the school division would make necessary the development and implementation of an extensive action plan. The task would be formidable for whoever takes it on, but is critical to the long-term success of science curriculum implementation.

Coordination of Initiatives

Several teachers expressed the opinion that there were no shortages of action plans. The problem was that there seemed to be too many action plans. Agnes expressed this when she stated, "It's sort of like a kid in high school where one teacher will give them a thirty page essay to do this month and another one will give them a math exam that day and everything piles up and nobody knows what the other one is doing." It is assumed by the Department of Education, Training and Employment that school divisions will sort and integrate initiatives into a coherent, manageable plan, or simply make hard choices as to what initiatives to support. It is also assumed both within government and by school divisions that the regional office will act as the Department's coordination and communication arm in the field. However, with departmental initiatives entering school divisions from a variety of directions, only one of which is the regional office, the coordination role can be compromised. An outline of events and initiatives in the school division under study provides a context for Agnes' comments.

Teachers at the time of research had been introduced to Science, were being introduced to Arts Education, and saw English Language Arts on the horizon.

In addition the Indian and Metis Education Branch of the Department of Education, Training and Employment successfully promoted a staff development plan with Northern Lights School Division. Leadership training was two days in duration, with a subsequent networking day. The expectation was that this initiative would then be taken back to the school where two inservice days would be devoted to it.

At approximately the same time the Evaluation and Student Services Division of the Department of Education, Training, and Employment also approached the school division regarding a major evaluation inservice plan. School division officials were impressed and embraced this program as well. Most principals were inserviced at a leadership training session and the expectation was that principals were to carry the message back to their schools and organize and facilitate an introductory inservice for their teachers. This initiative also entered the school division directly without contact with the regional office, impacting on teachers at a time when the new Arts Education curriculum was being introduced and during the third year of elementary science implementation.

Reference is made in research to the importance of "processual relationships" (Fullan, 1991a, p. 79). It is important that the various partners work together to deal with the challenges of implementing a complex initiative. The entrance of various initiatives into the school division through multiple entry points has complicated implementation realities for many teachers.

Planning for Involvement

Educators interviewed expressed, either directly or indirectly, the sentiment that implementation of curriculum change was something which was imposed,

both in terms of the product or outcome, and the process. Few teachers spoke about the consultative process out of which the curriculum renewal initiative grew. None were actually involved in piloting the elementary level science curriculum. No teachers spoke about being consulted about the development of implementation plans.

The literature makes reference to the importance of "processual relationships" (Fullan, 1991a). As early as 1978 Per Dalin stated that "real changes cannot occur without the full involvement of the participants in educational institutions" (p. 1). Fullan (1993) describes change as being "too important to be left to the experts" (p.39) and indicates that all teachers have the responsibility to "help create an organization capable of individual and collective inquiry and continuous renewal, or it will not happen" (p. 39). Teachers I spoke with do not feel that they are part of the process. It is not uncommon to find that "the teacher, upon whom the change finally depends, comes in at the very end of a long innovative history" (Dalin, 1978, p. 18). A major challenge in order to fully implement the elementary science curriculum, will be to build in processes for meaningful teacher involvement in the development and implementation of action plans.

Teacher Responses to Action Plans

In the face of the challenges of implementing a variety of action plans teachers are making choice or setting aside the curriculum initiatives and dealing with underlying or prerequisite issues. One teacher identified classroom management as an issue which put a damper on his curriculum implementation efforts this year. His approach is described as "What I can hold in these two hands is what I do, no matter how much they set up before me."

Another teacher's approach to the challenge was to maintain a focus on science, giving only limited attention to Arts Education and to English Language Arts. "The ones that we are receiving now, I don't think we are doing nearly the job that we have been doing with science." Kerry put it quite succinctly when she said "You end up trying to decide which one you are going to do--one or the other."

Most teachers indicated that they were working hard at implementation. Agnes describes her efforts. "It's a lot of work because there is hardly a night when I don't cart home things and many nights I am still working on it at eleven o'clock at night after twenty-one years of teaching. Burns you out after a while."

Summary

Action plans, in the context of implementing the elementary level science curriculum, can be looked at from two perspectives. From the one perspective we are talking about action plans to get things started--a general sense of where we want to go and the general manner in which we are to get there. Teachers spoke about such action plans when they referred to implementation timelines or acquisition of resources. Teachers had things to say about the various components of this action plan. From another perspective action plans can be seen to refer to an overarching plan to deal with change--a commitment and a general strategy to deal with emerging issues and concerns which are inevitable when implementing an initiative which impacts on resources and their usage, instructional practices, and beliefs about science teaching and learning.

The former type of action plan is in place and educators in the three schools are grappling with its implications. However, the second type of action plan is not evident--from either the school division or the Department of

Education, Training and Employment. This second type of action plan contains within it a commitment to curriculum maintenance--to deal with emerging concerns and to make adjustments as implementation proceeds. It contains within it measures to ensure instructional leadership at both school division and school levels to provide pressure and support. It also contains within it plans to assist teachers in dealing with change--whether it be the need to better gather and use resources, or the need to expand instruction and assessment repertoires. If the implementation of the elementary science curriculum is to proceed, both types of action plans will need to be in place.

Concluding Remarks

Research suggests that each individual approaches change from his or her own perspective and that at the core of educational change is the issue of how individuals come to grips with change on a personal level (Fullan, 1982). Marris (1975) describes a process of reintegration where individuals have to grapple with the change and work out a "reformulation which makes sense to them" (p. 166). Often people "approach others without sufficient empathy about what those individuals also have to go through to reach a conclusion" (Sparks, 1992, p. 7). My research confirms that change is indeed very personal. Teachers spoke extensively about investments of time and effort to try to make the program work. They raised a variety of concerns regarding implementation which warrant further inquiry.

This research has served to heighten in me an awareness that in order to understand the implementation of a major change such as this, one must see the process as consisting of a variety of individual realities constantly interacting and changing as the process builds. Those entrusted with coordinating the implementation effort should not be described as skilled directors of a finely

tuned orchestra working toward the final note of a symphony. The reality is very different.

The orchestra in reality consists of a collection of musicians varying in experience, skills, and commitment trying to play a similar piece of music. These musicians are not equally adept at reading the music hence some keep pace, some lag, while yet others race ahead. Some play by ear, seldom glancing at the sheets before them, following the basic melody and improvising as they go. A few have the wrong music or are reading it upside down. Some are playing finely crafted instruments while others play instruments constructed out of household odds and ends. As the production unfolds, new musicians join in while others leave the concert hall. The hall echoes with squeals, squawks and irregular rhythms as the musicians strive toward the conclusion of a symphony the last page of which they have not seen. Occasionally a player turns in a virtuoso performance.

Several sections of the orchestra create harmonious music while others look around for somewhere else to sit, not pleased with the music being produced by those nearby. Occasionally a player stops to retune or change instruments. Some players tire and look for easier music. Others gain strength from the challenge and carry on. Some enjoy the music they are producing while others play along despite the feeling that they are producing a discordant din. Some commend the conductor while others see the conductor as doing more harm than good and actively suggest a change in personnel.

As the symphony moves along some listeners sit through the whole performance. Others leave at opportune moments to attend to other tasks, sharing their impressions with others, some of whom are funding the performance. New viewers slip into the empty seats, trying to gain a sense of where the symphony has come from and where it is going. Some applaud, while

others boo and hiss. Many look and listen with mild interest. A few join in. Many people walk by on the street, totally unaware that anything significant is taking place within the theatre which, at least on the surface, seems to have remained unchanged for as long as one can remember.

As all of the above proceeds, the conductor creates the impression that he understands all and that he has most variables working together toward a greater purpose. However, in truth the conductor has in front of him sheets of music, not containing exact details but rather the general direction of the piece. Indeed, some of the pages are missing and a few require extensive improvisation. Few opportunities exist for the conductor to engage in consultations with either the players, other conductors, or those funding the performance. Pressures exist to shorten intermissions and get to the end, while many of the players tire and want longer intermissions and a change to rest, retune, and read ahead. As the performance goes on, daily newspapers are full of mixed reviews--some positive, some negative, some based on attendance at the symphony, some based on talking to someone who talked to someone who heard the performance as they drove by the concert hall in their Buick.

What I found in my research was a confirmation that implementing change is complex, personal, "a process, not an event" (Fullan, 1982, p. 41) and that the various phases of the process take varying lengths of time and that "events at one phase can feed back to alter decisions taken at previous stages" (Fullan, 1982, p. 39).

It is hoped that the data presented here offer insight into implementation of the science curriculum in these three schools and will lead to a deeper understanding of curriculum implementation, and enhanced implementation efforts. In the following chapter I make a few concluding remarks and several recommendations which, if implemented, could assist with implementation.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

Educators spoke about a range of factors affecting implementation. Many of their concerns, such as struggling with multiple initiatives, striving to find time for planning, and learning about new instructional methods, are likely shared by teachers in many parts of Saskatchewan. Other concerns, such as an altered school year can be considered as unique to the north. In order to effectively support the implementation of the science curriculum, strategies are needed to address all concerns, both those which could be labelled as generic, and those which seem uniquely northern.

Before implementation concerns can be addressed we must learn more about the realities of individual teachers. All teachers interviewed approached the implementation of the science curriculum from their own perspective. I conclude that no single strategy would address concerns for all three schools and certainly not for all teachers in the three schools studied. Any effective strategy to support implementation should be preceded by accurate data gathering on implementation realities for teachers and schools. Any effective strategy to support implementation of the science curriculum should be flexible in order to address the wide range of needs present in northern classrooms and the development of such a strategy should involve teachers in a meaningful way.

Schon (1971) spoke about the need to understand, guide, influence, and manage change. "We must make the capacity for undertaking them integral to ourselves and to our institutions. We must invent and develop institutions which are 'learning systems', that is to say, systems capable of bringing about their own continuing transformation" (p. 30). In 1977 Fullan identified the main problem in implementation as being that "curriculum change usually necessitates certain organizational changes, particularly changes in the roles and role relationships of those organizational members most directly involved in putting the innovation

into practice" (p. 337). In 1993 Fullan describes the new problem of change as being the pursuit of what it would take to make the educational system "a learning organization--expert at dealing with change as a normal part of its work" (p. 4).

Twenty two years separate the earliest and most recent writings cited here but the message is similar--a message echoed throughout this study. Challenges with implementation of the elementary science curriculum would best be addressed by focusing efforts on enhancing and developing school and school division capacity to deal with change as a regular process, rather than as an event which can be addressed by a number of specific support measures. Several of my recommendations focus on the development of such capacities.

This study could only address a few of the factors that affect change in northern schools. Considerable research is needed to more fully understand the status of implementation efforts and the various factors at work. I suggest the following as potentially fruitful areas of research.

Suggestions for Research

*Further research into the status of implementation of new curricula in schools and classrooms to help ensure than maintenance strategies are directed at actual areas of need.

*Research into new ways of addressing the need for teacher professional development. Possible areas of exploration could be altered school year options, possible incentives for further education, or ways to staff and organize schools to make professional development a daily occurrence rather than a periodic event.

*Investigation of ways to more effectively bring communities and schools together in order to overcome long-standing instances of community alienation from school as an institution.

*Research into effective means of nurturing instructional leadership in schools and school divisions where networking and professional development are challenged by realities of distance and cost.

*Research into more effective ways of informing parents and others what changes are taking place in education, what challenges are being faced, as well as what successes being achieved.

Action Recommendations

Recommendation One

The clarification of the role to be played by school division supervisory personnel, most notably Superintendents of Education, in the support of curriculum implementation. Such clarification should be accompanied by appropriate duty allocation.

Recommendation Two

A reassessment of the role to be played by the Department of Education, Training and Employment in curriculum maintenance. The aim of this reassessment should be to develop strategies to enable regional office staff and other department personnel to better support schools and school divisions in their efforts to develop and implement curriculum implementation support plans.

Recommendation Three

The development and implementation of measures to support principals and school supervisory personnel in their efforts to play a more proactive role in instructional leadership to support the implementation of new curricula. Issues such as instructional expectations and levels of training pertaining to instructional leadership could be starting points.

Recommendation Four

Continued support for such measures as science fairs, steering committees, consultants, and networking opportunities--measures which have proven successful in supporting and promoting implementation.

Recommendation Five

Greater efforts in initial inservice and subsequent support measures to focus teacher attention on underlying principles shared by various curricula, such as instructional approaches, planning techniques, and assessment options.

Recommendation Six

The development of resources and strategies to assist educators in their efforts to integrate various curricula as they plan units and themes. This should include measures to facilitate the sharing of such materials with other teachers.

Recommendation Seven

The development and implementation of measures to heighten awareness by parents, and other partners in education, of the changes taking place in schools, the challenges faced by educators, and the successes being achieved.

Recommendation Eight

The development and implementation of measures to more closely link school and community, particularly in those communities where a gap between school and community is apparent. Successful models, such as those incorporating home visitations, could be a starting point.

Recommendation Nine

The implementation of measures to address organizational challenges to the implementation of new curricula such as resource purchasing and coordination, class size, and school year format.

Recommendation Ten

To promote success and innovation through the recognition of teachers who have made notable moves toward the types of teaching and learning advocated in new curricula. Measures could include the identification of implementation coaches who could act as catalysts or supports for teachers in neighboring schools. Exemplary implementation efforts could be recognized with opportunities for further educational opportunities with the support of teacher organizations or the school division.

Recommendation Eleven

Greater and more effective involvement of school-based educators in curriculum implementation strategizing, thereby recognizing the importance of both their perspectives on, and their ownership of, the change process. A starting point for such involvement could be the examination of the composition, roles, and responsibilities of steering committees, as well as the linkage of these committees to both the school division and regional decision-making processes pertaining to curriculum implementation and maintenance.

Recommendation Twelve

More consistent use of the coordinating functions of the regional office of the Department of Education, Training, and Employment by various department branches to help ensure consistency of message and achievability of program objectives. The role played by the regional office in working collaboratively in planning for curriculum development, implementation, maintenance, and evaluation should continue and should be enhanced appropriately.

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APPENDICES

Appendix A--Letter of Request

Saskatchewan

Saskatchewan
Education,
Training and
Employment

Northern Education

P.O. Box 5000
La Ronge, Canada
S0J 1L0

(306) 425-4380

May 17, 1993

TO: Dennis Lokinger, Director of Education
Northern Lights School Division No. 113

RE: Research Pertaining to Curriculum Implementation

This letter is written to request your permission for me to conduct interviews with several teachers in Northern Lights School Division. These interviews would form part of my Master's Thesis, as well as enable me to gather data to assist with implementation of new curricula.

Curriculum implementation will be explored using the following areas of focus:

1. What is the teacher's vision of a classroom where elementary level science education is taking place?

2. Where is the teacher in the achievement of the vision?

3. What factors have helped or hindered teachers in translating the vision into reality?

It is hoped that data gathered during the interviews will assist me in identifying which implementation variables are assisting and which variables may be hindering implementation of the elementary science curriculum. Such information should prove valuable in formulating and enacting ongoing and emerging implementation strategies.

I have selected three schools and a variety of teachers as outlined below:

Gordon Denny School (3 participants)
Hector Thiboutot School (3 participants)
Stony Rapids School (2 participants)

Research will be conducted according to the ethical guidelines I have attached (Appendix B). Information, as well as conclusions and

. . ./2

recommendations arising from this research will be shared with Northern Lights School Division. It is hoped that you see this area of research as valuable and grant me permission to ask teachers to participate in the study.

I look forward to your response and welcome the opportunity to discuss this project with you further.

Sincerely,

Daryl

Daryl Arnott
Regional Co-ordinator, Curriculum & Instruction

DA/bc
c.c. Don Shinske
Ralph Pilz

Appendix B--Letter of Permission

NORTHERN LIGHTS SCHOOL DIVISION No. 113

Bag Service #6500 La Ronge, Saskatchewan S0J 1L0
Telephone: (306) 425-3302 Fax: (306) 425-3377

May 27, 1993

Daryl Arnott
Curriculum Development
Saskatchewan Education
Box 5000
LA RONGE, Saskatchewan
S0J 1L0

Dear Daryl:

Your request to interview Division teachers at
and
is approved. Please contact Principals for further arrangements. Good luck with your research.

Sincerely,

Dennis Lokinger
Director of Education

DL/bph

Appendix C--Confirmation of Roles

Confirmation of Participant/Researcher Roles

Title of Study: **Factors Affecting the Implementation of an Elementary Science Curriculum in Three Northern Saskatchewan Provincial Schools**

This is an M Ed study being conducted under the supervision of Dr. Alan Ryan, Department of Curriculum Studies, University of Saskatchewan, (966-7574). If you have any questions about the study, please contact him.

The following ethical guidelines will be observed during the course of this study in order to protect the interests and anonymity of the participant:

Confidentiality

*Participants are assured that the confidentiality of all data gathered will be maintained and that the names or locations of participants will not be used in the printing of this study.

*Participants have the right to withhold from this study any information they deem to be private or not in the interests of this study.

Data Collection, Confirmation, and Interpretation

*Participants will be informed of the nature and purposes of this project, as well as the nature of their participation in it. Data collected during the courses of this study will be analyzed and used in the context of the purpose of this study. All tapes and transcripts will be destroyed upon completion of the study.

*Participants will be provided with the opportunity to correct factual inaccuracies in the data, and review interpretations made or conclusions drawn.

Withdrawal

*Participants have the right to withdraw from the study at any time and to have any data arising from their interview which they deem inappropriate deleted from the study.

Both the participant and the researcher have read the preceding ethical considerations and have agreed to participate in the study according to the noted guidelines.

teacher: _____

Date: _____ researcher: _____

Appendix D--Participant Release Form

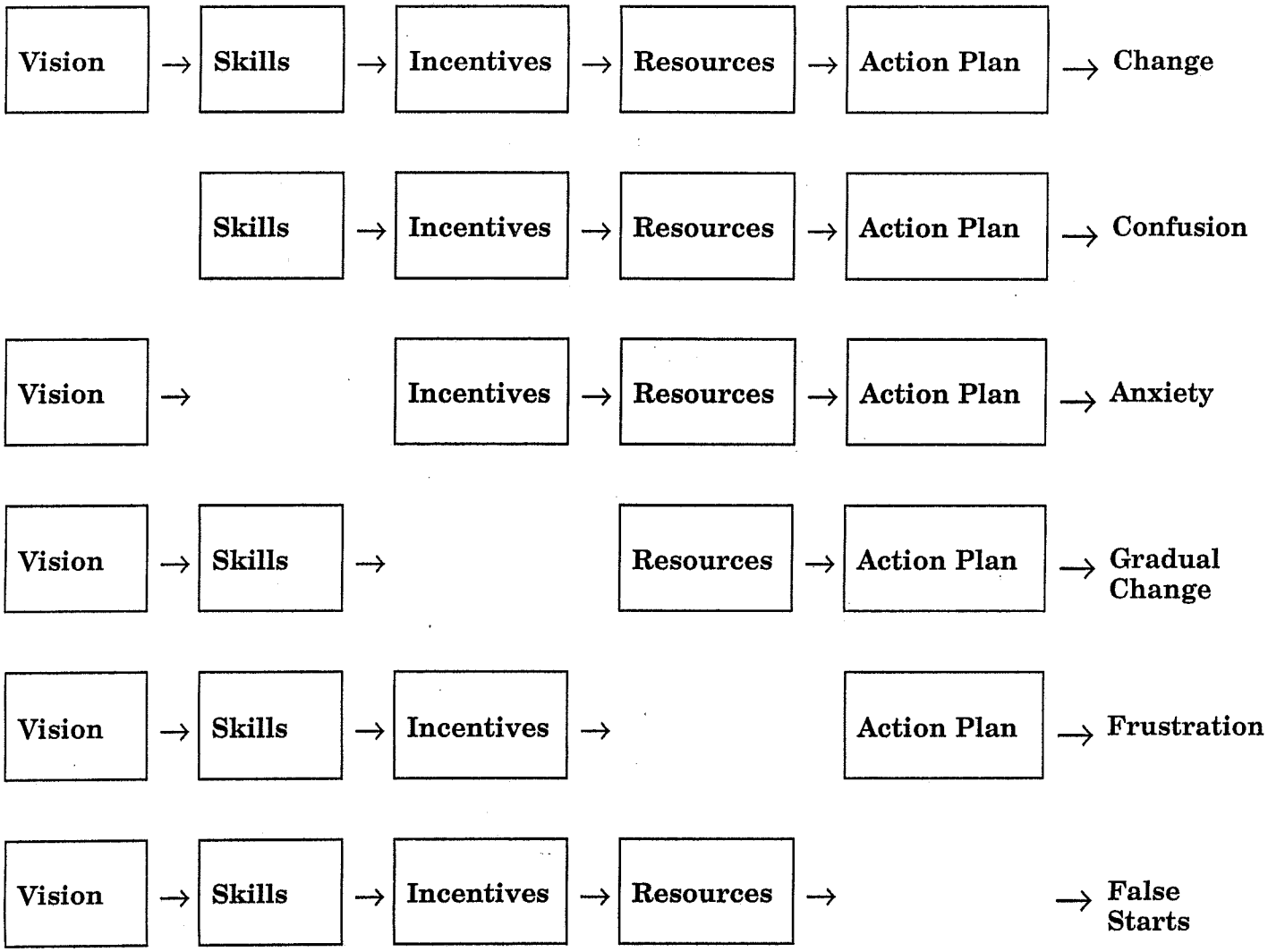
Participant Release Form

As a participant in this study I release the information as it has been presented to me. I understand that no additional quotations or other data pertaining to my interview will appear in the final thesis unless I have been consulted beforehand and have completed an additional release.

Date: _____ respondent: _____

Appendix E--Managing Change

Managing Complex Change



Fleming (1987)

Appendix F--Implementation Schedule

GRADE	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
K			Kindergarten				
1	Arts Education	ELA/Social St.	ELA/Social St.	Math	Math	Phys.Ed./Health	
2	Arts Education	ELA/Social St.	ELA/Social St.	Math	Math	Phys.Ed./Health	
3	Arts Education	ELA/Social St.	ELA/Social St.	Math	Math	Phys.Ed./Health	
4	Arts Education	ELA/Social St.	ELA/Social St.	Math	Math	Phys.Ed./Health	
5	Arts Education	ELA/Social St.	ELA/Social St.	Math	Math	Phys.Ed./Health	
6	Social Studies		Arts Educ.	Phys. Ed.	ELA	Math	
7		Science	Arts Educ.	Phys. Ed.	ELA	Math	
8		Science	Arts Educ.	Phys. Ed.	ELA	Math	
9		Science	Arts Educ.	Phys. Ed.	ELA	Math	
10	Social Studies	Wellness		Math		ELA	
11	Science	Science	Phys. Ed./Science	Math/Life Trans.	Social Studies	ELA	
12	Science	Science	Phys. Ed./Science	Life Transitions	Math/Social Studies	ELA	

GRADE	1994/95		1995/96		1996/97		1997/98		1998/99
K	Kind(1) (2)(Fall)								
1	ELA(3) (Fall)	ELA(4)(Winter) Soc.St.(1) (Spring)	Soc.St.(2) (Fall)	Math(1) (Spring)	Math(2) (Fall)	Math(3) (Winter)	Health/Ph. Ed. (Fall)	Ph.Ed.(2) (Winter)	
2	ELA(3)	ELA(4) Soc.St.(1)	Soc.St.(2)	Math(1)	Math(2)	Math(3)	H/PE(1)	H/PE(2)	
3	ELA(3)	ELA(4) Soc.St.(1)	Sbc.St.(2)	Math(1)	Math(2)	Math(3)	H/PE(1)	H/PE(2)	
4	ELA(3)	ELA(4) Soc.St.(1)	Soc.St.(2)	Math(1)	Math(2)	Math(3)	H/PE(1)	H/PE(2)	
5	ELA(3)	ELA(4) Soc.St.(1)	Soc.St.(2)	Math(1)	Math(2)	Math(3)	H/PE(1)	H/PE(2)	
6	Arts Ed.(1) (Fall)	Arts Ed.(2) (Winter) Phys.Ed.(1) (Spring)	Arts Ed.(3) (Fall) Phys.Ed.(2)	Math(1) (Spring) Arts Ed.(4) (Winter)	Math(2) (Fall)	Math(3) (Winter) ELA(1) (Spring)	ELA(2) (Fall)	Guidance(1) (Spring) ELA(3)(Winter)	Guid.(2) (Winter)
7	Arts Ed.(1)	Arts Ed.(2) Phys.Ed.(1)	Arts Ed.(3) Phys.Ed.(2)	Math(1) Arts Ed.(4)	Math(2)	Math(3) ELA(1)	ELA(2)	Guidance(1) ELA(3)	Guid.(2)
8	Arts Ed.(1)	Arts Ed.(2) Phys.Ed.(1)	Arts Ed.(3) Phys.Ed.(2)	Math(1) Arts Ed.(4)	Math(2)	Math(3) ELA(1)	ELA(2)	Guidance(1) ELA(3)	Guid.(2)
9	Arts Ed.(1)	Arts Ed.(2) Phys.Ed.(1)	Arts Ed.(3) Phys.Ed.(2)	Math(1) Arts Ed.(4)	Math(2)	Math(3) ELA(1)	ELA(2)	Guidance(1) ELA(3)	

GRADE	1994/95		1995/96		1996/97		1997/98		1998/99	
10	Wellness(1) Info.Proc(2) (Fall)	Wellness(2) (Winter) Math(1) (Spring)	Math(2) (Fall)	ELA(1) (Spring)	ELA(2) (Fall)	ELA(3) (Spring)				
11	Phys.Ed(1) Soc.St.(1) Info. Proc.(2) (Fall)	Phys.Ed.(2) Soc. St.(2) (Winter) Math(1) Life Trns.(1) (Spring)	Math(2) Life Trns.(2) (Fall)	ELA(1) (Spring)	ELA(2) (Fall)	ELA(3) (Spring)				
12	Phys.Ed.(1) Info. Proc.(2) (Fall)	Phys.Ed.(2) (Winter) Math(1) Life Trns. (Spring)	Math(2) Life Trns.(2) (Fall)	Can. St. (1) ELA(1) (Spring)	Can. St.(2) ELA(2) (Fall)	ELA(3) (Spring)				